

EXAMINING THE ACCURACY, UNIFORMITY & EQUITY OF PHILADELPHIA'S 2023 REAL ESTATE ASSESSMENTS

CEPA cooperated in the research and writing of this report, which was supervised and published by Reinvestment Fund (RF) of Philadelphia. The report's data, as with most evaluations, will quickly become outdated and lose their interest. However, the general outline of the report and the evaluative statistics in it provide an example of how to measure the quality of any reassessment anywhere. In addition, certain parts of the report provide background information and analysis that will remain useful over time for anyone who cares about the property tax or wants to see good assessments. For example:

- An introduction to the role of property taxes in local government and the meaning of property tax fairness (pages 1-2).
- * Having the proper set of real estate sales, both when making assessments and when evaluating them (pages 33-36 and 45-49).
- Challenges to overcome when making and evaluating assessments. If these challenges are ignored or not properly dealt with, they can produce systematic bias and lead to unintended disparate impacts on various groups of property owners (Appendix I, page 41).
- The role of appeals in determining property tax fairness (Appendix II, page 56).
- Understanding how the tax bill of any individual property owner depends not only on their own assessment and government spending, but also on everyone else's assessment (Appendix III, page 57).

The entire report, in addition to following this page, can also be found on RF's website, <https://www.reinvestment.com/insights/examining-the-accuracy-uniformity-equity-of-philadelphias-2023-real-estate-assessments> (as of 8/12/24).

PLEASE NOTE: There are errors in the legend box for several of the maps: Executive Summary Maps 9 (page xiv) and 11 (p. xv) and, in the main body of the report, Maps 10 (p. 28), 11 (p. 29), 14 (p. 31), and 15 (p. 32). We apologize for our inadequate editing and are in the process of correcting the mistakes.

—Arthur Lyons



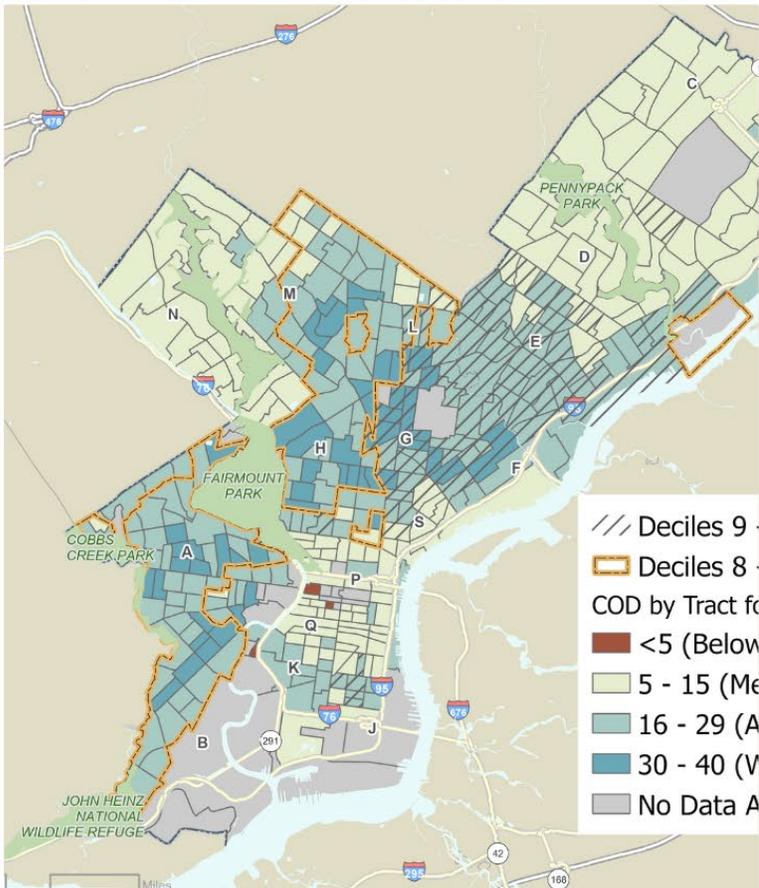
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Examining the Accuracy, Uniformity & Equity of Philadelphia's 2023 Real Estate Assessments

Prepared by **REINVESTMENT FUND**

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Examining the Accuracy, Uniformity & Equity of Philadelphia’s 2023 Real Estate Tax Assessments

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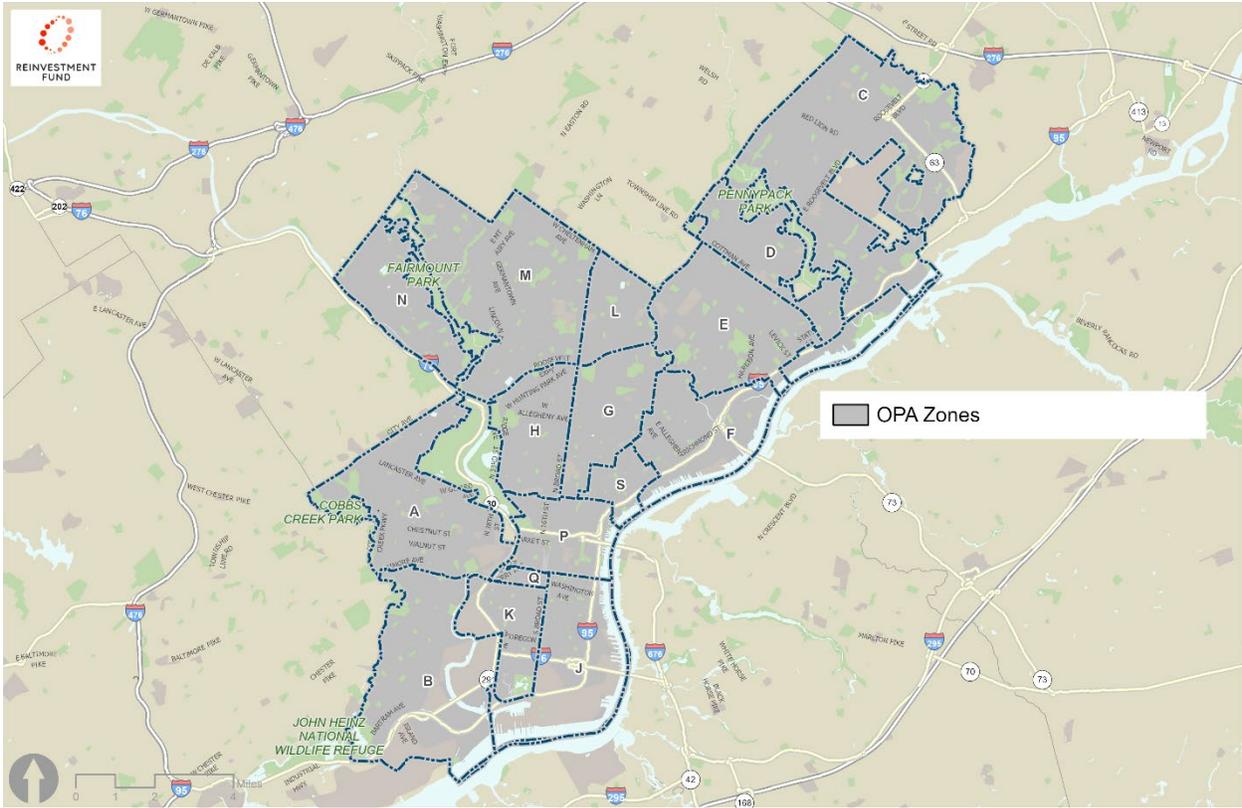
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Executive Summary

This study examines two interrelated issues. First, we examine the accuracy and uniformity of Philadelphia residential tax assessments (generally called a “ratio study”). Second, we examine how racial, ethnic, and economic demographics interact with those assessments (an “equity study”). This ratio study examines assessed values of residential properties, with one to four units, certified by the Office of Property Assessment (OPA) for the 2023 tax year. The 2023 assessments represent the first citywide re-assessment since 2019. Prior studies of the 2019 assessments found that while residential properties were generally under assessed citywide, properties in certain neighborhoods in North and West Philadelphia were more likely to have assessments that manifest regressivity, were non-uniform, and generally non-compliant with industry standards. This Executive Summary provides a top-level summary of our findings and recommendations, including graphics to illustrate those findings. The body of the report then provides a much more detailed discussion of: 1) the importance of our use of two datasets used in the study; 2) how we analyzed both datasets to evaluate assessment quality and racial equity; and 3) a more detailed discussion of policy and our findings and recommendations, including considering some pathways to more accurate assessments.

This report uses three measures to evaluate assessment quality: 1) median assessment ratio; 2) coefficient of dispersion (COD); and 3) price-related differential (PRD). It applies these measures to two different datasets: 1) **OPA Sales**, which includes sales data that OPA deemed appropriate for a ratio study and 2) **Reinvestment Fund Sales**, which includes sales data that Reinvestment Fund and CEPA deemed appropriate for a ratio study, based on standards set forth by the International Association of Assessing Officers (IAAO).

OPA separates Philadelphia into 16 assessment areas (called “OPA Zones”), and this report shows each of the assessment quality measures for each OPA Zone and both datasets. The boundaries of OPA Zones are shown in Map 1 below. The standard ranges for each assessment quality measure are set by the IAAO.



Executive Summary Map 1: OPA Zones

Measures of Assessment Quality

Accuracy: Do the assessed values typically match sale prices? Accuracy is generally evaluated with the median ratio of assessed value to sale price. The median is the middle value when all ratios are arranged from lowest to highest.

Uniformity: How much variation is there in the ratios? Put another way, how much does the ratio for any randomly selected property differ, on average, from the median ratio? Uniformity is measured with the coefficient of dispersion (COD).

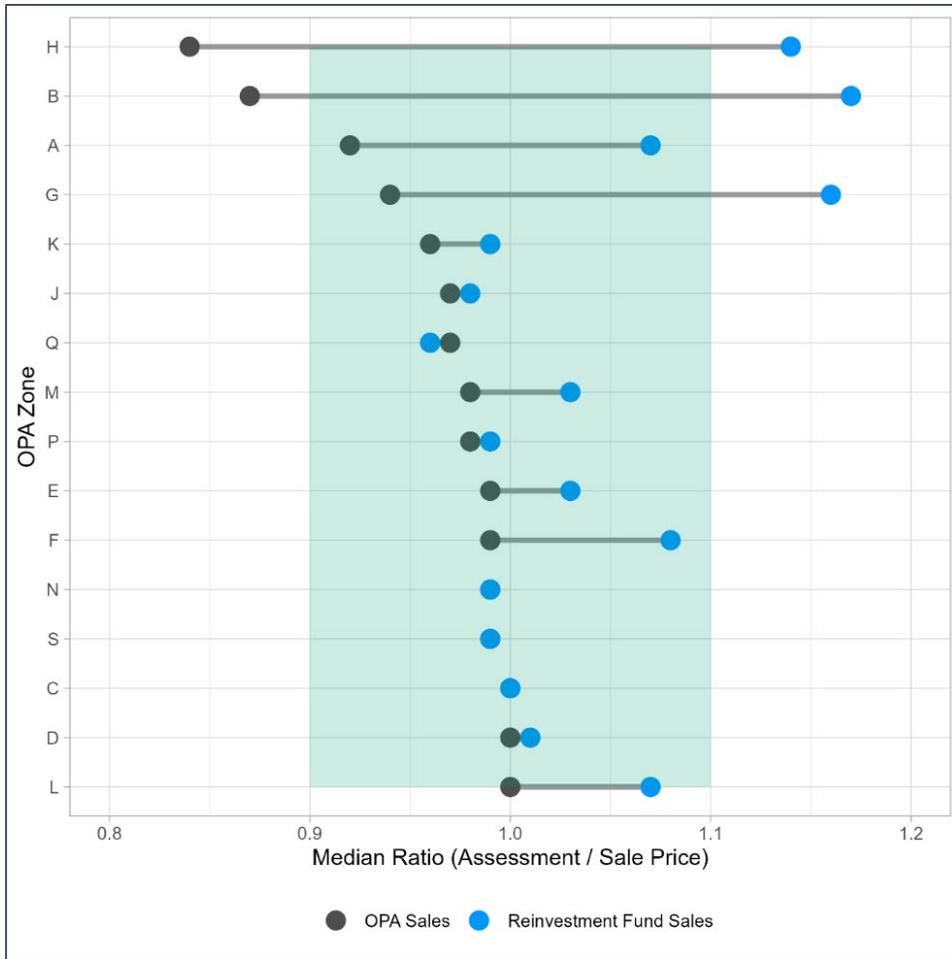
Price-Related Regressivity: Are lower valued properties over assessed relative to higher valued properties? One commonly used measure to answer this question is the price-related differential (PRD). The IAAO refers to PRD as a measure of vertical equity, or of “regressivity or progressivity” with respect to price. A PRD above 1.00 shows that the owners of lower value properties are paying a proportionately higher amount of property taxes than the owners of high valued properties.

Measures of Assessment Quality: Median Assessment Ratio

- The median assessment ratio of assessed value to sale price is a measure of accuracy. The median is the middle value when all ratios are arranged from lowest to highest. The median ratio shows whether the median property in an area is accurately assessed at that

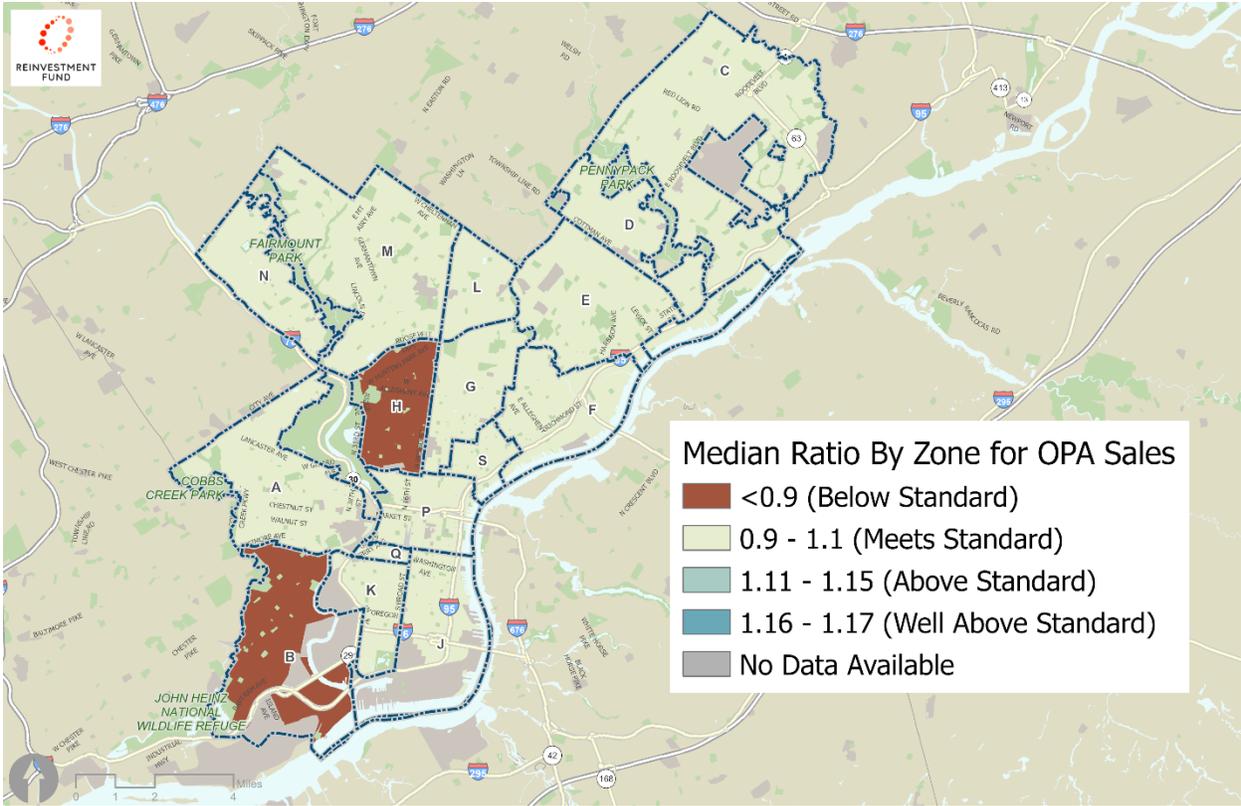
property's market value. The International Association of Assessing Officers' (IAAO) standard for the median ratio is 0.9 to 1.1.

- Figure 1 below shows the median ratio for each OPA Zone and for both datasets. The IAAO standard for median assessment ratio is shown in aqua; computations based on OPA Sales are shown with dark grey circles and those based on Reinvestment Fund Sales are shown with blue circles; the difference between the two datasets is shown with the gray bar. When the median ratio was the same in both datasets, the points overlap (i.e., Zones N, S, and C).
- Figure 1 shows that OPA Zones H [North Philadelphia West] (0.84 with OPA Sales and 1.14 with Reinvestment Fund Sales) and [Southwest Philadelphia] (0.87 with OPA Sales and 1.17 with Reinvestment Fund Sales) are clearly not within IAAO standards for the median ratio *using either dataset*, and that OPA Zone G [North Philadelphia West] (0.94 with OPA Sales and 1.16 with Reinvestment Fund Sales) is outside of the standard range with Reinvestment Fund Sales.

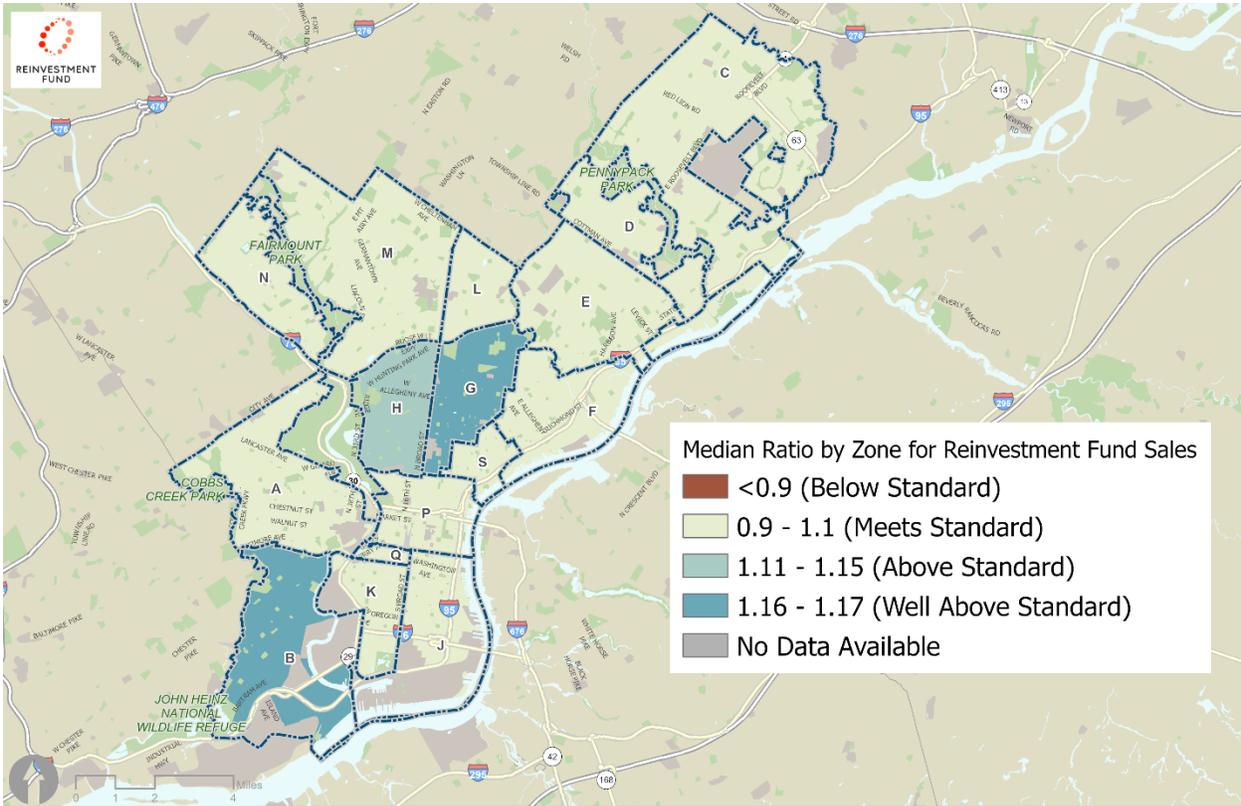


Executive Summary Figure 1: Median Ratio of Assessment to Sale Price by OPA Zone [The aqua-colored rectangle is the generally acceptable range according to IAAO standards.]¹

¹ IAAO, "Standard on Ratio Studies," April 2013, (available at: https://www.iaao.org/media/standards/Standard_on_Ratio_Studies.pdf). Accessed 8/17/2023.



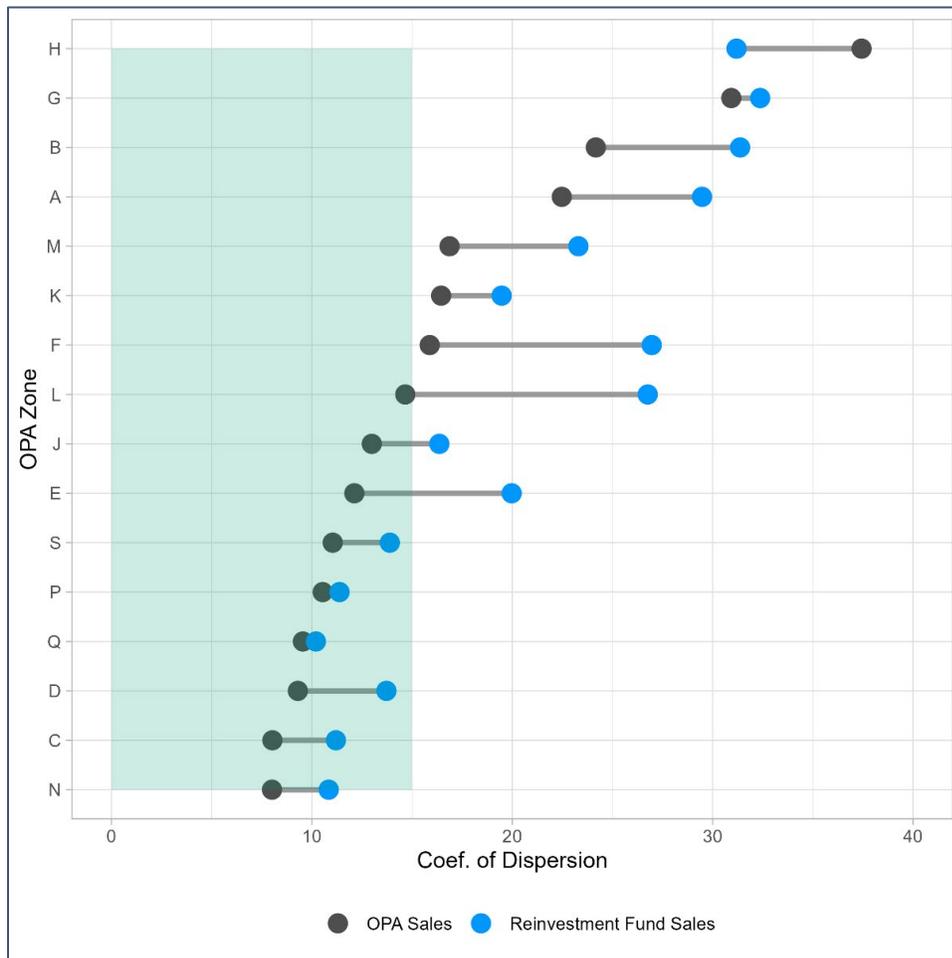
Executive Summary Map 2: Median Ratio by OPA Zone for OPA Sales. [Light khaki areas meet the IAAO standard.]



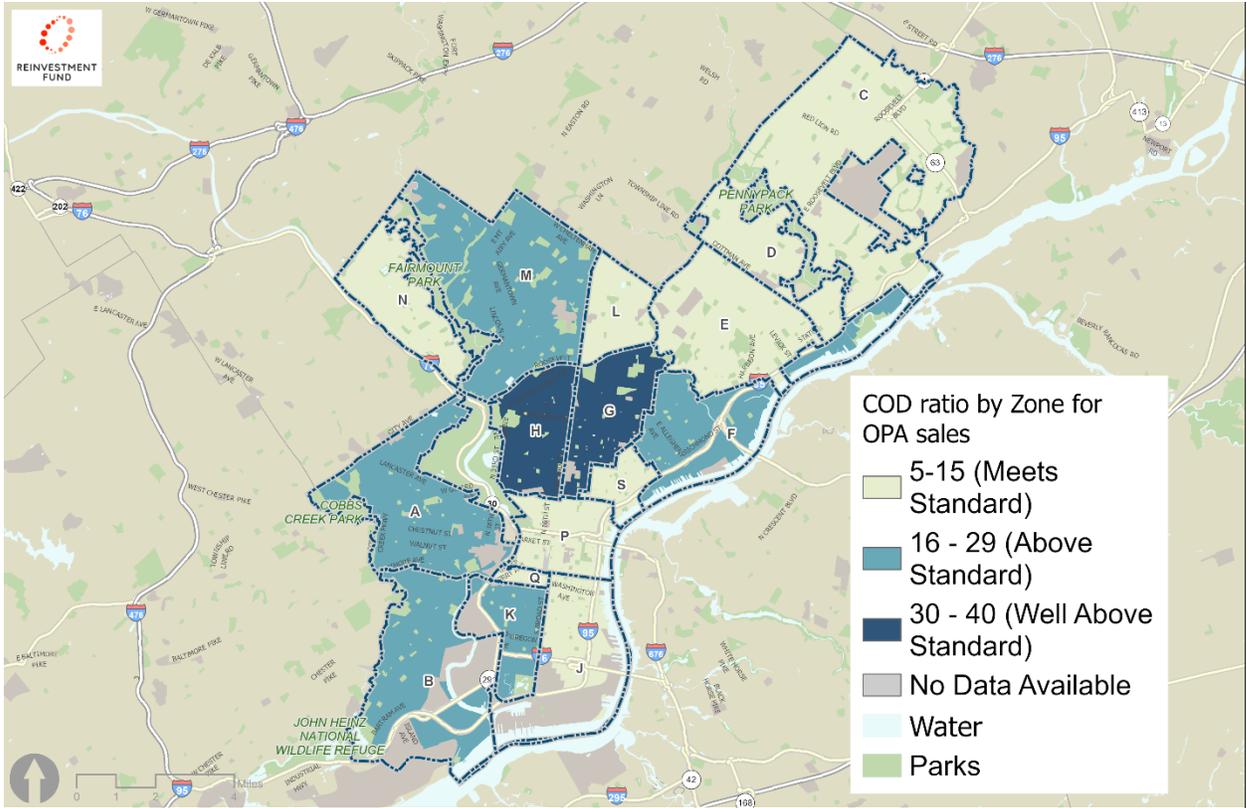
Executive Summary Map 3: Median Ratio by OPA Zone for Reinvestment Fund Sales. [Light khaki areas meet the IAAO standard.]

Measures of Assessment Quality: Coefficient of Dispersion (COD)

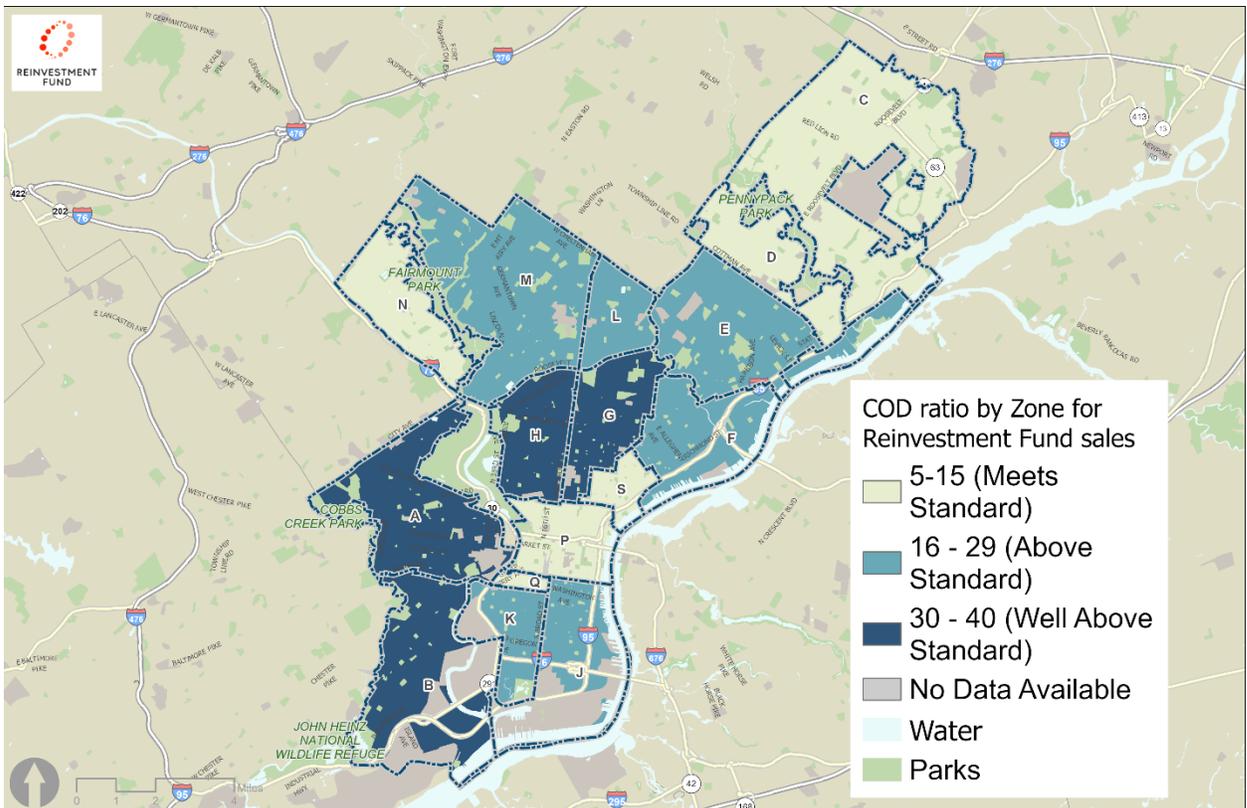
- The COD is a basic statistical measure of assessment uniformity. For any group of properties, COD is the average deviation of each individual assessment ratio from the group median ratio, expressed as a percentage. The IAAO standard is that COD should be lower than 15.
- Zones H [North Philadelphia West] (37 in OPA Sales and 31 with Reinvestment Fund Sales), G [North Philadelphia East] (31 with OPA Sales and 32 with Reinvestment Fund Sales), B [Southwest Philadelphia] (24 with OPA Sales and 31 with Reinvestment Fund Sales), and A [West Philadelphia] (22 with OPA Sales and 29 with Reinvestment Fund Sales) are well outside of the acceptable range in both datasets (see Figure 2 below).



Executive Summary Figure 2: COD by OPA Zone [The aqua-colored rectangle is the generally acceptable range.]



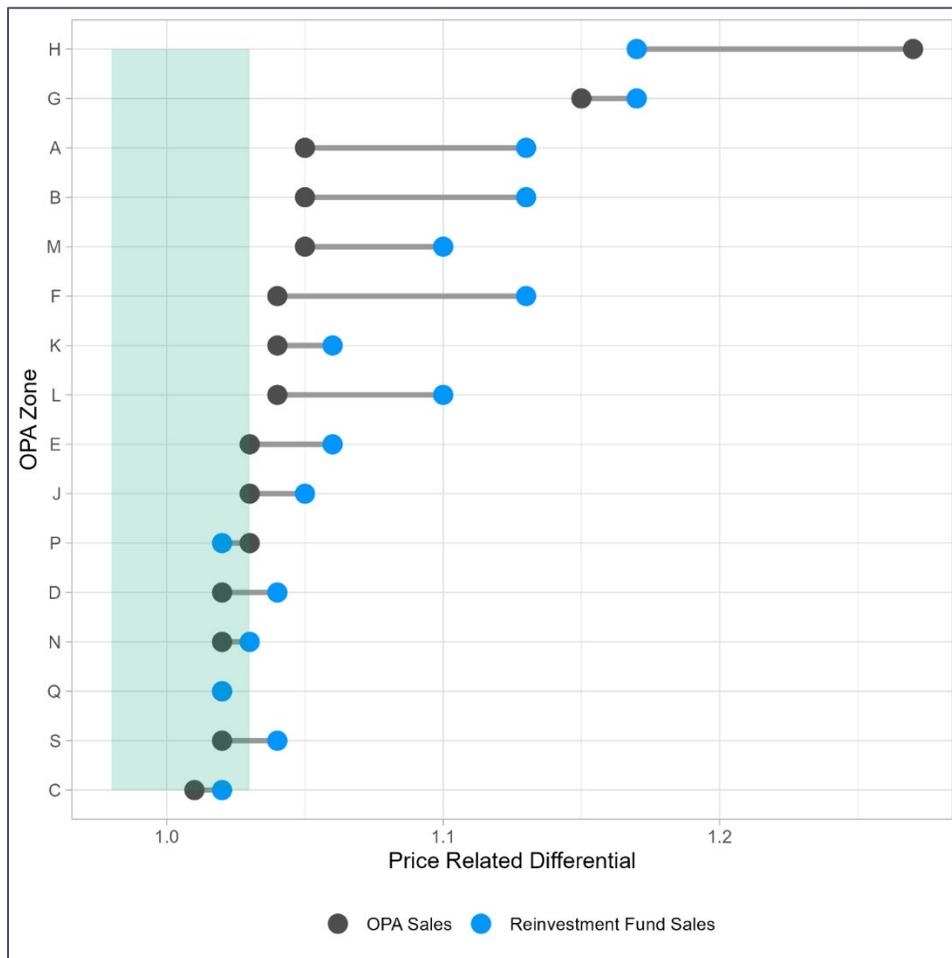
Executive Summary Map 4: COD by OPA Zone for OPA Sales. [Light khaki areas meet the IAAO standard.]



Executive Summary Map 5: COD by OPA Zone for Reinvestment Fund Sales. [Light khaki areas meet the IAAO standard.]

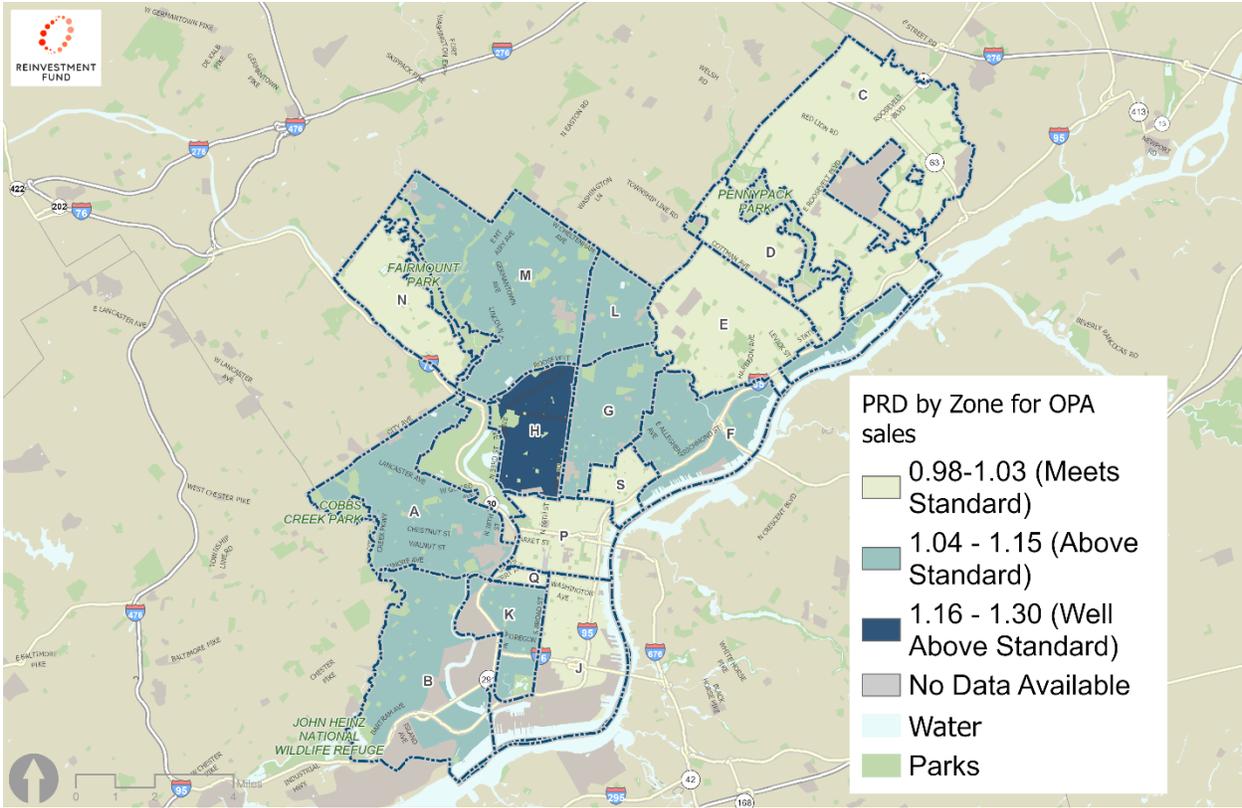
Measures of Assessment Quality: Price-Related Differential (PRD)

- PRD measures regressivity - the extent to which low price properties are over or under assessed relative to higher priced properties. A PRD below 1.00 indicates that low price properties are under assessed compared to higher price properties, 1.00 indicates that low and high price properties are uniformly assessed, and above 1.00 indicates that low price properties are over assessed relative to high price properties.
- The generally acceptable range for PRD is between 0.98 and 1.03.² Two OPA Zones are clearly above that range in both datasets showing regressivity that is disadvantageous to lower value properties: OPA Zones G [North Philadelphia East] (1.15 in OPA Sales and 1.17 in Reinvestment Fund Sales) and H [North Philadelphia West] (1.27 in OPA Sales and 1.14 in Reinvestment Fund Sales). Zones A, B, M, F, K, and L are all slightly above the industry standard when using OPA Sales but well above the industry standard when measured with Reinvestment Fund Sales.

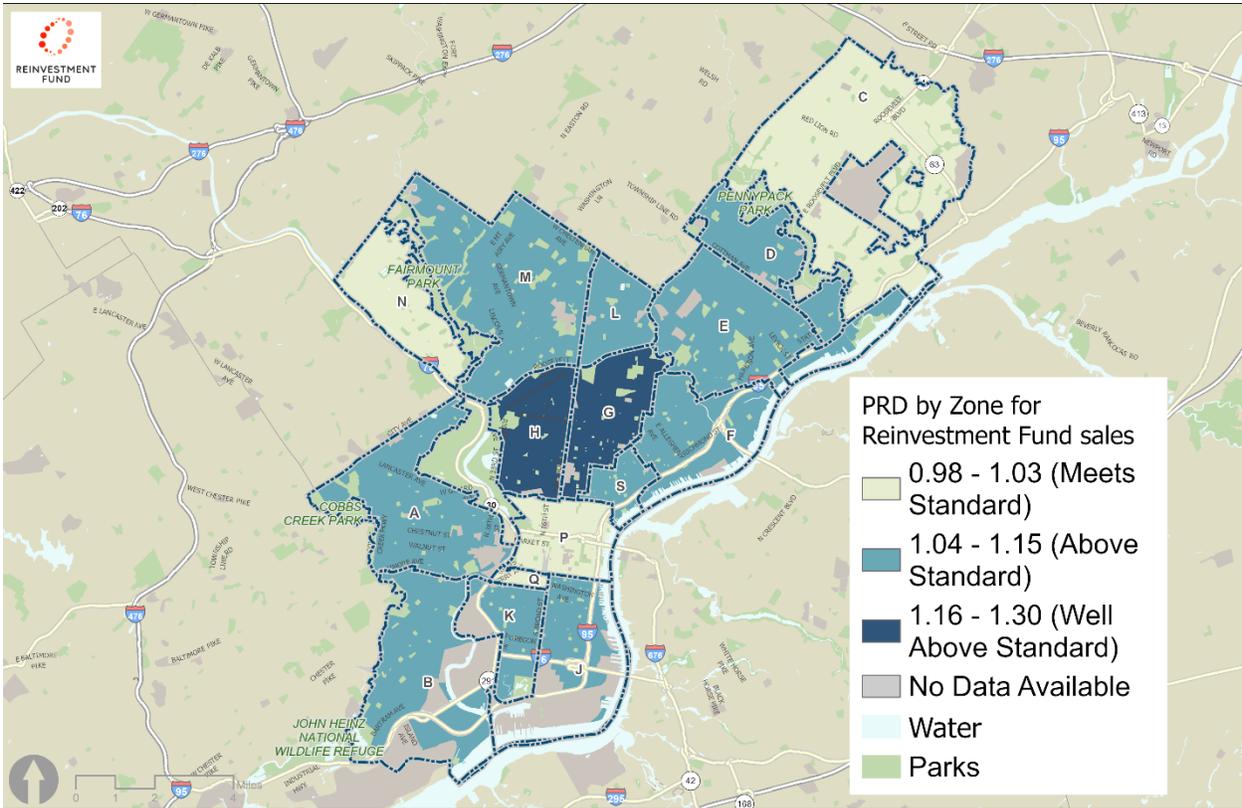


Executive Summary Figure 3: PRD by OPA Zone [The aqua-colored rectangle is the generally acceptable range.]

² See *supra* IAAO note 1 at page 8.



Executive Summary Map 6: PRD by OPA Zone for OPA Sales. [Light khaki areas meet the IAAO standard.]



Executive Summary Map 7: PRD by OPA Zone for Reinvestment Fund Sales. [Light khaki areas meet the IAAO standard.]

Equity in Assessments: The Statistical Evidence of Three Types of Systemic Neighborhood Bias

- Comparing the demographics of OPA Zones with measures of assessment quality shows that people residing in areas that have lower incomes, higher percentages of Black residents, and higher percentages of Hispanic residents are more likely to experience assessment quality problems. This is true regardless of which dataset was used in the analysis.
- The OPA Zones with the highest median assessment ratios, COD, and PRD are generally lower income and with high shares of Black and/or Hispanic residents.

OPA Zone	Demographics			Median Ratio		Coef. of Dispersion		Price-Related Differential	
	Percent Pop. Black	Percent Pop. Hispanic	Median Household Income	RF Sales	OPA Sales	RF Sales	OPA Sales	RF Sales	OPA Sales
B	83.7%	4.0%	\$36,969	1.17	0.87	31.4	24.2	1.13	1.05
H	77.3%	6.2%	\$29,295	1.14	0.84	31.2	37.4	1.17	1.27
M	73.8%	2.9%	\$53,605	1.03	0.98	23.3	16.9	1.10	1.05
A	70.0%	4.0%	\$35,422	1.07	0.92	29.5	22.5	1.13	1.05
L	64.4%	18.5%	\$39,684	1.07	1.00	26.8	14.7	1.10	1.04
K	32.2%	8.1%	\$55,666	0.99	0.96	19.5	16.4	1.06	1.04
G	29.5%	57.2%	\$21,853	1.16	0.94	32.4	30.9	1.17	1.15
E	29.3%	30.1%	\$45,021	1.03	0.99	20.0	12.1	1.06	1.03
Q	21.0%	4.3%	\$126,137	0.96	0.97	10.2	9.6	1.02	1.02
D	14.9%	15.5%	\$57,048	1.01	1.00	13.7	9.3	1.04	1.02
F	13.6%	43.2%	\$40,860	1.08	0.99	27.0	15.9	1.13	1.04
N	12.0%	6.5%	\$81,870	0.99	0.99	10.8	8.0	1.03	1.02
P	10.5%	6.7%	\$96,935	0.99	0.98	11.4	10.5	1.02	1.03
C	9.5%	8.6%	\$67,000	1.00	1.00	11.2	8.0	1.02	1.01
S	6.3%	16.3%	\$83,620	0.99	0.99	13.9	11.0	1.04	1.02
J	6.1%	13.4%	\$74,104	0.98	0.97	16.4	13.0	1.05	1.03

Executive Summary Table 1: Demographic and Assessment Characteristics by OPA Zone (Sorted by % Black) [Cells shaded red denote problematic ranges of the given indicator.]

- OPA Zones are quite large, and people who know Philadelphia recognize that within those large areas you will find great variability in the demographics and economics of the residents. Therefore, to understand whether the assessment issues identified for OPA Zones exist in more homogeneous places, assessment quality measures were also calculated for each Census tract in Philadelphia, which are much smaller than OPA Zones. Census tracts were organized into deciles³ for: (1) median household income; (2) share of residents who are Black; (3) share of residents who are Hispanic.
- Table 2 below shows that by one measure of assessment quality, the median ratio, OPA is generally within IAAO standards when Census tracts are ranked by race.
- However, Table 2 also shows that Census tracts with higher shares of Black residents are more likely to have high CODs and high PRDs than are Census tracts with lower percentages of Black residents. Put another way, Table 2 shows that the Census tracts with the most assessment quality issues (highest median assessment ratios, COD, and PRD) are again those tracts with high shares of Black residents.

Census Tract Race		Median Ratio 0.9-1.1		Coef. of Dispersion < 15		Price-Related Differential 0.98-1.03	
Race Decile	% Pop. Black	RF Sales	OPA Sales	RF Sales	OPA Sales	RF Sales	OPA Sales
10	90.3 – 98.9%	1.08	0.96	29.0	19.4	1.12	1.05
9	82.5 – 90.3%	1.17	0.93	30.8	26.1	1.13	1.10
8	61.4 – 82.1%	1.05	0.96	27.5	22.3	1.11	1.07
7	41.7 – 60.7%	1.02	0.95	23.2	19.3	1.10	1.07
6	25.1 – 41.3	1.04	0.99	22.9	15.2	1.09	1.04
5	16.1 – 24.9%	1.01	0.98	18.8	13.2	1.09	1.05
4	10.2 – 15.8%	1.02	0.99	17.8	11.2	1.07	1.03
3	5.4 – 10.1%	0.99	0.99	13.5	11.0	1.04	1.03
2	1.7 – 5.2%	0.99	0.99	14.0	10.5	1.05	1.02
1	0.0 – 1.7%	1.00	0.99	15.7	10.5	1.04	1.02
Philadelphia	39.7%	1.01	0.99	20.6	14.8	1.09	1.04

Executive Summary Table 2: Median Ratios, COD, and PRD by Census Tract Percentile Black Residents decile

³ A decile is one tenth of Philadelphia's 408 Census tracts, either 40 or 41 tracts per decile.

- Table 3, below, shows that the Census tract decile with the very highest concentration of Hispanic residents (more than 37%) has a relatively high median assessment ratio (with Reinvestment Fund Sales) and a high COD and PRD (with both datasets). The nine deciles with lower concentrations of Hispanics are closer to citywide figures. OPA Sales show a tighter conformity to citywide figures in most areas, although still elevated COD and PRD in the areas with the most Hispanic residents such as Logan and Frankford.

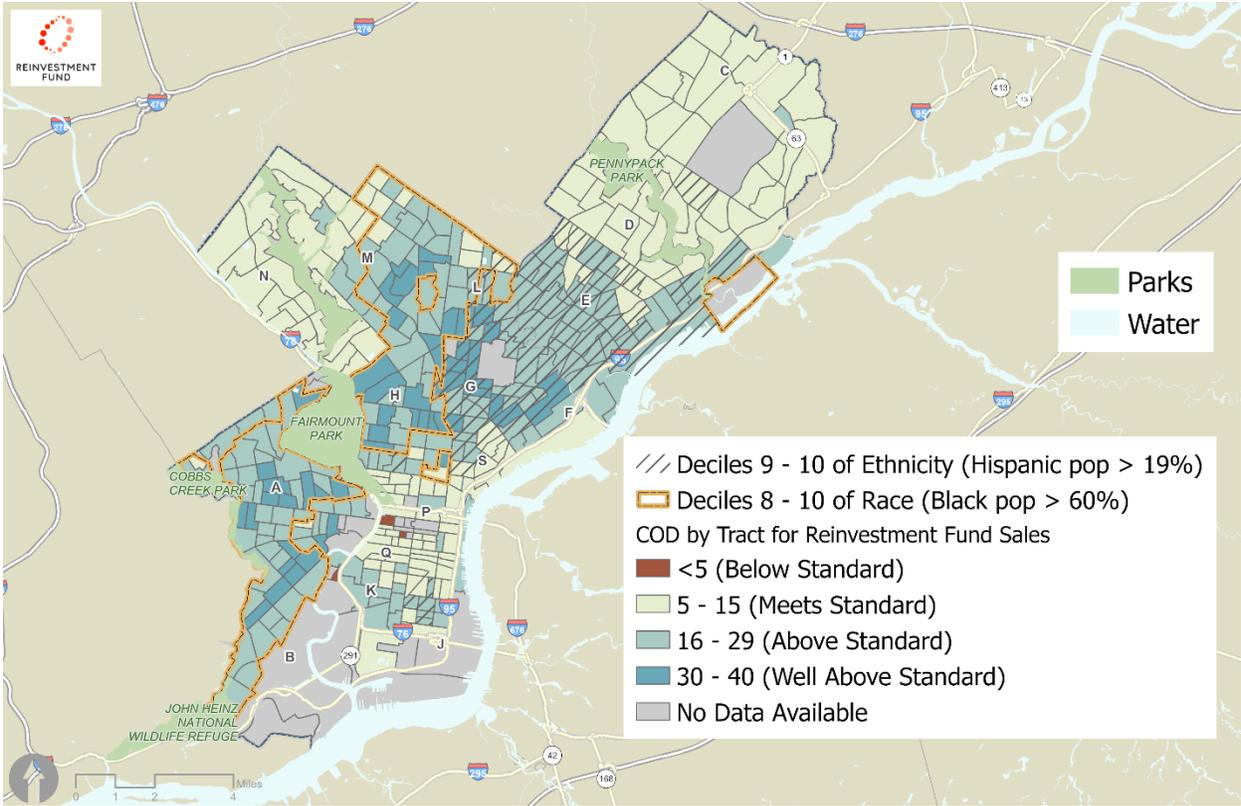
Census Tract Ethnicity		Median Ratio 0.9-1.1		Coef. of Dispersion < 15		Price-Related Differential 0.98-1.03	
Ethnicity Decile	% Pop. Hispanic	RF Sales	OPA Sales	RF Sales	OPA Sales	RF Sales	OPA Sales
10	37.4 – 91.7%	1.11	0.98	29.4	21.0	1.13	1.08
9	19.4 – 36.7%	1.03	0.99	20.4	12.8	1.07	1.03
8	11.6 – 19.3%	1.01	0.99	15.8	11.7	1.05	1.02
7	8.1 – 11.6%	1.00	0.99	15.0	12.3	1.05	1.03
6	6.3 – 8.0%	0.99	0.97	15.7	12.7	1.06	1.03
5	4.8 – 6.3%	1.00	0.97	18.4	15.2	1.07	1.03
4	3.7 - 4.8%	1.01	0.98	18.8	15.9	1.08	1.05
3	2.3 - 3.7%	1.00	0.96	23.3	16.8	1.11	1.04
2	0.8 - 2.2%	1.02	0.97	24.3	18.4	1.12	1.05
1	0.0 - 0.8%	1.06	0.96	27.8	18.4	1.15	1.05
Philadelphia	15.4%	1.01	0.99	20.6	14.8	1.09	1.04

Executive Summary Table 3: Median Ratios, COD, and PRD by Census Tract Deciles, Sorted by Percent Hispanic Residents

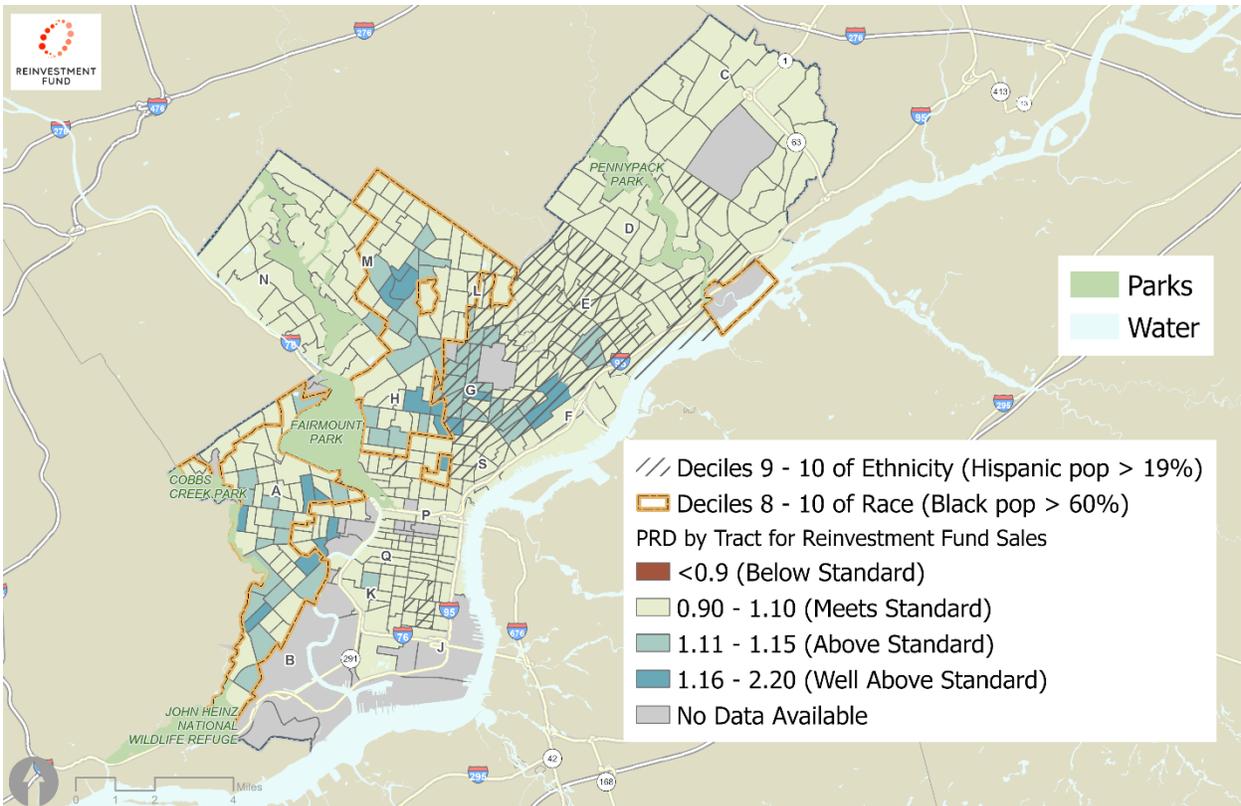
- When Census tracts are grouped by median household income, Table 4 shows that property owners in areas with a median income above about \$81,000 per year have assessments that are reasonably accurate and uniform by all measures and both datasets. In contrast, owners in an area with incomes less than about \$58,000 have very high CODs and PRDs regardless of which dataset is used. Three of the lower income deciles also have high median assessment ratios according to Reinvestment Fund Sales.

Census Tract Income		Median Ratio 0.9-1.1		Coef. of Dispersion < 15		Price-Related Differential 0.98-1.03	
Income Decile	Med. Income	RF Sales	OPA Sales	RF Sales	OPA Sales	RF Sales	OPA Sales
10	\$95,455-\$210,322	0.98	0.98	11.7	10.5	1.03	1.03
9	\$81,367-\$94,735	0.99	0.98	12.2	10.9	1.03	1.03
8	\$66,830-\$81,262	0.98	0.98	14.3	11.3	1.03	1.02
7	\$58,349-\$66,217	1.01	0.99	16.3	12.1	1.04	1.02
6	\$49,787-\$58,186	1.02	0.99	18.3	13.5	1.06	1.04
5	\$45,154-\$49,748	1.03	0.98	22.0	15.9	1.09	1.05
4	\$36,712-\$44,917	1.07	0.97	26.5	18.3	1.11	1.05
3	\$30,077-\$36,646	1.12	0.94	30.5	26.0	1.14	1.12
2	\$21,670-\$29,597	1.15	0.95	30.8	25.5	1.14	1.10
1	\$11,955-\$21,638	1.23	0.97	30.6	29.0	1.19	1.13
Philadelphia	\$52,649	1.01	0.99	20.6	14.8	1.09	1.04

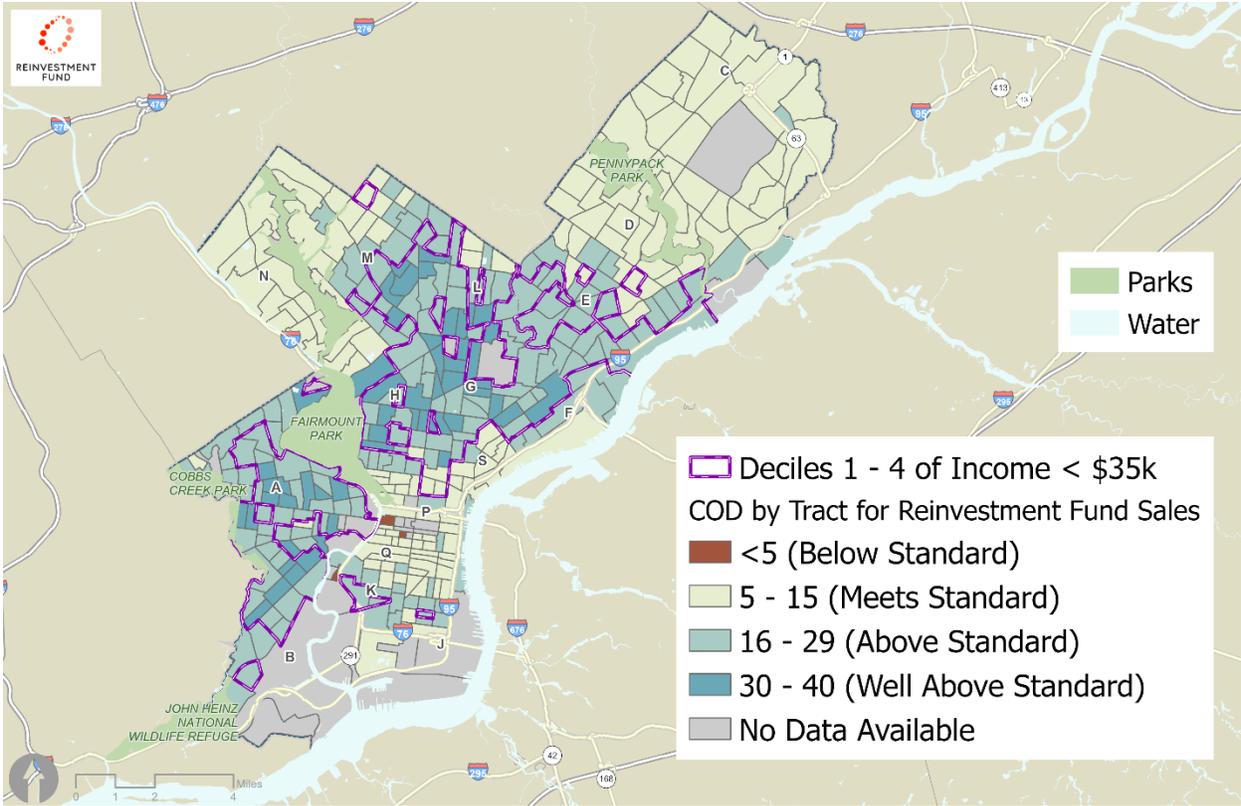
Executive Summary Table 4: Median Ratios, COD, and PRD by Census Tract Deciles, Sorted by Median Household Income



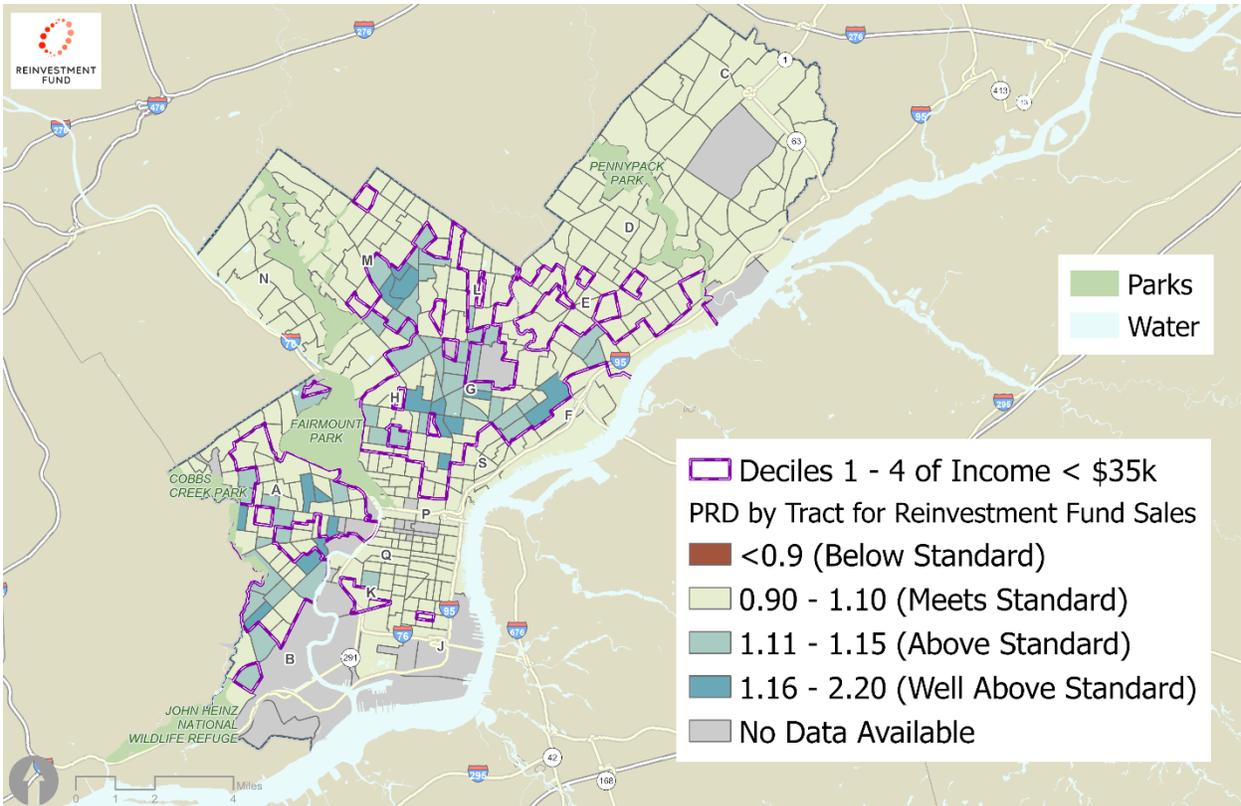
Executive Summary Map 8: COD for Reinvestment Fund Sales Denoting Areas of Racial / Ethnic Concentration



Executive Summary Map 9: PRD for Reinvestment Fund Sales Denoting Areas of Racial / Ethnic Concentration



Executive Summary Map 10: COD for Reinvestment Fund Sales Denoting Low Income Areas



Executive Summary Map 11: PRD for Reinvestment Fund Sales Denoting Low Income Areas

Findings and Recommendations

OPA has improved the quality of property tax assessments and reduced the incidence of racial, ethnic, and income-related bias in assessments from 2019 to 2023. However, *regardless of which data is used to evaluate the 2023 assessments – whether OPA Sales, which is OPA’s preferred database, or Reinvestment Fund Sales, which is a less restrictive set but still consistent with IAAO standards for data in a ratio study – we find:*

- 1. The median assessment ratio for residential properties in Philadelphia is close to where it should be, regardless of which dataset is used.***
- 2. The average variation in assessments around the citywide median ratio exceeds IAAO standards when evaluated with Reinvestment Fund Sales and just barely meets the standard using OPA Sales.***
- 3. For the city as a whole, regardless of which dataset is used, low value residential properties are over assessed relative to higher value properties at a rate that exceeds the IAAO standard.***
- 4. Many OPA Zones also show non-uniformity and regressivity in assessments that are outside of the IAAO standard.***
- 5. The OPA Zones that show unacceptably high levels of non-uniformity and regressivity are those with the largest shares of Black residents, Hispanic residents, and low-income residents. In other words, if a person lives in an OPA Zone that has a higher percentage of Black, Hispanic or low-income residents, they are more likely to experience property assessments that are not uniform and are disadvantageous to owners of lower value properties.***
- 6. Similarly to OPA Zones, neighborhoods⁴ that contain the largest shares of Black residents, Hispanic residents, and low-income residents are also more likely to be inaccurately assessed, over assessed, and suffer from under assessment of high value properties relative to lower value properties. In other words, if a person lives in a neighborhood that has a higher percentage of Black, Hispanic or low-income residents, they are more likely to experience property assessments that are not uniform and are disadvantageous to owners of lower value properties.***

We therefore recommend that the City take steps⁵ to ensure that OPA continues to make progress on assessment quality and, most importantly, take affirmative steps to reform their methodology so that any resulting assessment inaccuracies and variation are not borne disproportionately by Philadelphia’s Black, Hispanic, and low-income neighborhoods and residents. To do so, we recommend that the City take the following steps:

- Retain an independent third-party to conduct a racial equity study annually to examine potential systemic bias in OPA assessments and recommend appropriate, data-based

⁴ Definitions of neighborhoods vary. We use the Census tract as our proxy for “neighborhood”.

⁵ For suggestions on how to improve assessments, see [Appendix I: Some Pathways to Consistently Better Assessments](#).

reforms. The study should monitor OPA’s assessment processes for any inappropriate connection to the racial, ethnic, or economic composition of the neighborhood where each property is located. OPA should provide the third-party examiner access to all procedures, methodologies, and datasets that OPA used to determine each property’s assessed value.

- Increase transparency by publicly releasing all datasets used in creating property assessments, including the set of sales that were excluded and the reasons why they were excluded, the set of sales and any features used in modeling, and the modeling code and/or output on Open Data Philly or a similar platform. This has become standard process in some jurisdictions,⁶ and Philadelphia should follow suit.
- Create a plan for evaluating each step of the assessment process for systemic bias after the initial valuation is completed without taking race, ethnicity, or income into account. Review each step for potential biases after completion. Publicly release the results of these reviews so progress can be tracked over time. While the initial valuation process cannot and should not consider race as a factor, OPA should set up a system to check for unintentional errors or bias, particularly in “hotspot” Black and Hispanic neighborhoods.
- Make the methodology and results for creating property condition grades public, including data used for grading each individual property. Ensure the methodology was applied consistently by all OPA staff and reviewed annually for deviation from guidelines and how those deviations relate to bias in assessments.
- Ensure no sales of properties with tax abatements are included in creating assessments.
- Convene a stakeholder group including representatives from OPA, City Administration, City Council, real estate professionals, legal services organizations, and other interested parties to meet at least twice each year to review progress toward implementing the above recommendations and to address other issues and concerns.

⁶ For example, Cook County’s (Chicago) entire codebase and data are available at: https://gitlab.com/ccao-data-science---modeling/models/ccao_res_avm%23data-used, accessed 8/17/2023. Florida Appraisers (which is their term for Assessors) release datasets of each evaluated sale, whether the sale is determined as qualified or not, and why. For example here is Duval County (Jacksonville): https://www.coj.net/departments/property-appraiser/information-offerings#Collapse_Expand7, accessed 8/17/2023.

- We recommend an independent review of Philadelphia’s principal assessment review body, the Board of Revision of Taxes (BRT). Just as city residents need a clear understanding of OPA and its work, so also do they need an understanding of BRT.⁷

What Does All This Mean for Philadelphians?

This report makes clear that determining whether Philadelphia assessments are fair and accurate is a complex question. Expanding that analysis to also include racial, demographic and economic factors makes the matter even more complex. At the end of the day, for many Philadelphia homeowners and legislators these complexities may boil down to the question: How does all of this affect me? Based on our study, we can say:

- First, Philadelphia’s Black, Hispanic and low-income neighborhoods tend to be less uniformly assessed. Assessments in Black, Hispanic and low-income neighborhoods do not satisfy the IAAO standard for COD ***regardless of whether examined with OPA Sales or Reinvestment Fund Sales.***

If you live in an area with a higher percentage of Black residents, Hispanic residents or in a lower income area, differences among neighbors in assessments as a percent of sale price are greater than in areas that are home to majority White and/or higher income residents.

- Second, the Price Related Differential (PRD) or economic bias is higher in Black, Hispanic and low-income neighborhoods ***again regardless of whether examined with OPA Sales or Reinvestment Fund Sales.***

Accordingly, if you own a higher priced home in these areas, your taxes (not accounting for homestead exemptions or abatements) are lower as a percentage of full value than if you own a lower priced home; these disparities are greatest in Black and lower income areas.

In short, the owner of a lower priced home in a predominately Black and low-income neighborhood will pay more than their fair share when compared to their neighbor down the street with a higher value home.

⁷ This report examined final OPA assessments prior to any appeals. In any large system such as OPA’s, there are bound to be occasional, non-systematic mistakes. The appeal process is where this type of mistake should be corrected and the final, taxable assessments be made fairer. But the appeal system can also increase unfairness, for example, if certain groups of property owners have greater access to the system than other groups and whenever an appeal is granted without sufficient evidence of assessment inaccuracy.

Examining the Accuracy, Uniformity & Equity of Philadelphia’s 2023 Real Estate Tax Assessments

Why Do We Care About the Property Tax?

No city can thrive and remain independent without a stable source of revenue under its own control. Transfers from the federal and state governments are undependable both because these grants come with many strings attached and because they can be reduced or eliminated at the whim of those legislators. Only locally raised revenue is reliable. Individually, we pay property taxes to our government to cover the cost of a variety of public goods and services (e.g., public education, police and fire protection, trash/recycling pick-up, parks and public libraries, etc.). As much as we may value those public goods and services, property taxes can represent a significant portion of the family budget. In Philadelphia, the typical owner-occupied household reports spending over \$145 per month towards this tax.⁸

Philadelphia is not alone in this respect. In most U.S. cities, the property tax is one of the largest sources of locally raised revenue. Because this tax is so central to the well-being of Philadelphia’s residents and businesses, it is especially important that the tax be fair.

Property Tax Fairness

Property tax fairness begins with Office of Property Assessment (OPA), which assigns the initial taxable assessed value to each of the roughly 580,000 parcels of real estate in the city. When all assessments are at the same fraction of market value (called the “assessment ratio”), everyone pays the same fraction of their property’s value in tax and the system is fair.

Inequities arise from either:

- incorrect assessments made by OPA and/or
- reductions improperly granted through the appeal system (that is, reductions that reduce a property owner’s assessment to a level below the median⁹ assessment ratio for all owners).

This report is about the first of these, the accuracy or inaccuracy of assessments made by OPA. The appeal system is important because it determines the final assessments on which taxes are based. However, all assessments begin with OPA, and this report evaluates OPA’s work. We

⁸ Reinvestment Fund computations based on the Census’ American Community Survey 5-Year 2021 sample show that the typical owner-occupied household in Philadelphia spent \$1,749 on property taxes. That represents a rise of 17.4% from the \$1,490 median in 2017.

⁹ The median is the middle when all numbers are ranked in order. The median of 1, 5, 12, 20, and 21 is 12. Half of all observations are below the median and half above.

believe the appeal system also needs evaluation, but that evaluation is beyond the scope of this project.

Beside the appeal process, deviations from the principle that everyone should pay tax in proportion to the value of their property arise from actions of state legislators and local city council members. Various exemptions (including “abatement” programs) reduce taxable assessments for specific types of property. In Philadelphia, these include exemptions for:

- new or rehabbed business property,
- new or rehabbed residential property,
- non-profit-owned real estate,¹⁰
- owner-occupied homesteads,
- homes owned and occupied by disabled veterans,
- homes owned and occupied by longtime residents,
- homes owned and normally occupied by armed services members on active duty,
- homes owned and occupied by low-income senior citizens, and
- owner-occupied homes on which the tax bill increased by more than a certain percent from the prior year.

In terms of other property owners, whether each exemption is fair depends on the political judgment and consensus of community residents. In the aggregate, because Philadelphia City Council members have chosen in recent years to hold the tax rate constant, these exemptions lead to a reduction in total revenue for the schools and other public services. Everyone in the city is affected because their government has less money to work with. Whether this is “good” or “bad” depends on one’s perspective.

Assessments, City and School Revenue, and Tax Bills

In cities like Philadelphia, where City Council members have chosen for the last several years to maintain the same property tax rate over time, changes in individual tax bills normally result only from reassessments (including *trending*). Under this system, an assessment that increases by ten percent will lead to a tax bill ten percent higher. Additional changes occur if state or city legislators modify the exemption laws.

Total city and school revenue varies from one year to the next by the sum of new construction added to the tax base, plus the net of assessment increases and decreases for existing property, minus the value of property removed from the tax base including from modifications in the exemption laws.

It has not always been this way in Philadelphia. In the past, sometimes when a reassessment occurred, the city calculated a new tax rate that held total property tax revenue at the previous year’s level – making the overall change revenue “neutral”. Individual tax bills still change in this

¹⁰ . . . for all types of non-profit use, over and above the U.S. Constitutional exemption for the separation of church and state.

scenario, although no longer in line with the assessment alone but instead by a factor that combines the change in the individual's assessment with the citywide rate change.

Many other cities routinely modify their tax rates each year. This usually happens through a budget-driven process in which government officials determine the total dollar amount they wish to collect from the property tax and enact a rate calculated to raise that specific amount. In this case, assessment exemptions do not affect total government revenue but instead increase everyone's taxes. The choice between adopting this method of rate-setting in Philadelphia and maintaining the fixed rate is a matter for local public discourse.

For more details about the relationships among assessments, government revenue, and tax bills, see Appendix III: Assessments, City and School Revenue, and Tax Bills.

Background

In July of 2020, Community Legal Services (CLS) partnered with Reinvestment Fund and the Center for Economic Policy Analysis (CEPA) to answer two specific questions:

1. Are residential properties assessed proportionately by OPA so that each property's assessed value is comparable to its actual market value, or is there evidence that lower value residential properties are consistently under assessed or over assessed?
2. Is there evidence of systemic racial bias in the assessments showing that majority-minority (Black and/or Hispanic) neighborhoods are more likely than other neighborhoods to be under assessed or over assessed?

CLS raised these questions because homeowners frequently came to CLS complaining about the fairness and accuracy of their assessments. Homeowners felt that the process was a mystery and often wondered how their own assessment could be higher than other similar homes on their block.

A proportional tax assessment system is legally mandated in Philadelphia and Pennsylvania.¹¹ Beyond the law, fair and equitable assessments are necessary for taxpayers to trust their government and for a sense (and reality) of social equity; taxpayers should have access to the data and information they need to know that their government is treating all people equally. Any inaccuracies in tax assessments should not be borne disproportionately by any one economic, racial or ethnic group and everyone should have the opportunity to build household and family wealth without being unfairly burdened by paying more than their fair share of taxes. Taxpayers with the least economic means, especially, should not have to pay the costs of assessment inaccuracies.

¹¹ Philadelphia Code § 19-1308.

The issues of non-uniformity and regressivity in property tax assessments and the potential for systemic racial bias are not unique to Philadelphia. These are nationwide problems that are now being acknowledged by cities across the country.¹² Researchers examining the problem in a variety of communities have found that lower priced properties are commonly over assessed (that is, pay higher property taxes relative to their market value than higher priced properties), that the highest priced properties are under assessed, and that over assessment is most common in majority Black and low-income neighborhoods.¹³

To look at how homes were assessed in Philadelphia for the 2019 tax year, Reinvestment Fund and CEPA conducted a “sales ratio study”, the industry-standard approach used to evaluate quality and fairness in assessments, according to the International Association of Assessing Officers (IAAO).¹⁴ The researchers used publicly available data provided online by the City as the basis for their study and, in February of 2021, Reinvestment Fund, CEPA, and CLS finalized our first detailed report: *Examining the Accuracy, Uniformity & Equity of Philadelphia Real Estate Assessments* (herein, the **2021 Report**).¹⁵

Consistent with earlier studies, the 2021 Report concluded that while residential properties were generally *under* assessed citywide, there were “hotspots” in low-income neighborhoods – for example, North Philadelphia – where assessments were consistently non-uniform and failed to meet IAAO standards. The 2021 Report found that homes valued at \$75,000 or less were consistently *over* assessed, resulting in higher real estate tax bills for these homeowners than if those properties had the same ratio of assessed-to-market value as higher priced properties. The 2021 Report then compared these neighborhood “hotspots” with demographic and economic data from the US Census's American Community Survey (ACS)¹⁶ and found that the problems with non-uniformity and regressivity – leading to inflated tax bills – were concentrated in Black and Hispanic neighborhoods.

Although various tax relief programs, such as the homestead exemption or Longtime Owner Occupant Program (LOOP) may reduce the impact of these over assessments on homeowners’ tax bills, it is a marginal benefit, at best, when an owner begins with an incorrectly high assessment and is reduced by a relief program, while others who begin with a correct assessment are reduced to an even lower level. In spite of relief programs, an owner who was

¹² See, e.g., Carlos F Avenancio-León, Troup Howard, *The Assessment Gap: Racial Inequalities in Property Taxation*, *The Quarterly Journal of Economics*, Volume 137, Issue 3, August 2022, pp. 1383–1434, (available at: <https://doi.org/10.1093/qje/qjac009>); University of Chicago Harris School of Public Policy, *Property Tax Fairness*, available at: <https://propertytaxproject.uchicago.edu/data-3-2-3/> (August 15, 2023) (providing evaluations of property tax regressivity for 50 U.S. cities, including Philadelphia).

¹³ See e.g., McMillen, Daniel and Ruchi Singh. *Assessment Regressivity and Property Taxation*. *The Journal of Real Estate Finance and Economics*. Volume 60, pp. 155-169 (available at: <https://doi.org/10.1007/s11146-019-09715-x>) (stating, “A stylized fact from the assessment literature is that assessment rates tend be lower for higher-priced home [sic]”).

¹⁴ See IAAO, “Standard on Ratio Studies”, April 2013, (available at: https://www.iaao.org/media/standards/Standard_on_Ratio_Studies.pdf), accessed 09/12/2023.

¹⁵ Reinvestment Fund, *Examining the Accuracy, Uniformity & Equity of Philadelphia Real Estate Assessments*, (February 2021).

¹⁶ U.S. Census Bureau. (2019). 2014-2018 American Community Survey 5-year Estimates, (available at: <https://www.census.gov/programs-surveys/acs/technical-documentation/table-and-geography-changes/2018/5-year.html>).

over assessed to begin with remains relatively over assessed and overtaxed, compared to owners who were correctly assessed and eligible for the same relief.

In short, relief programs are not intended to correct inaccurate assessments. These programs are created by state legislators and city council members to reduce property taxes for selected groups of owners judged to be worthy of lower taxes for one reason or another. OPA may seem to be the origin of relief programs because many of the laws creating the programs assign to OPA the task of verifying eligibility, but OPA can neither modify the terms of existing relief programs nor create new programs. This is the province exclusively of the legislative branch of government. OPA's role in government is to produce uniformly fair assessments.

With the goal of achieving fair assessments for Philadelphians in mind, we provided a copy of the 2021 Report to OPA. James Aros, Jr., the City's Chief Assessment Officer, and his staff agreed to meet with CLS, Reinvestment Fund and CEPA to discuss the findings in that Report and the steps OPA had taken to improve their process in the years following the 2019 reassessment. These discussions led to a year-long series of meetings with OPA. Kevin Keene, then OPA's Director of Mass Appraisals and Analysis, spent several months explaining how the mass assessment system worked in Philadelphia and how it changed in the period after the 2019 reassessment. Importantly, he provided his perspective about what data should and should not be used to create an accurate ratio study.¹⁷ OPA – much to their credit – agreed to provide this additional data to Reinvestment Fund and CEPA.

This ratio study for tax year 2023 is the product of that unique cooperative effort. During the course of these meetings, OPA released new assessed values from its first citywide reassessment since 2019, effective in tax year 2023. This reassessment resulted in an average increase for residential properties of 31%.¹⁸ In light of the very significant increases in residential property assessments¹⁹ in 2023 based on OPA's newest citywide reassessment, we decided to conduct a second ratio study to examine the effects of the changes in OPA's processes. This new ratio study addresses OPA's concerns regarding the importance of the data used in these studies related to the 2021 Report and looks at how using different sets of data for the evaluation might affect the results.

¹⁷ Kevin Keene has created educational materials and made those public online since our discussions. Those include extensive discussion about how to edit a sales file for assessment modeling and ratio studies. See generally: Keene, Kevin. Educational Resources. Available at: <https://keenemac.com/free-resources>.

¹⁸ Although the median increase was 31% citywide, median increases ranged from 5% in OPA Zone P (Center City) to 73% in OPA Zone H (North Philadelphia West) and 97% in OPA Zone G (North Philadelphia East). See Office of the Controller, Data Release: Property Assessment Accuracy. August 3, 2022, (available at: <https://controller.phila.gov/philadelphia-audits/opa-accuracy-2023/>). Accessed 10/10/2023.

¹⁹ Throughout the report we mostly discuss tax assessments rather than the final tax bill because correct property tax assessments are legally mandated regardless of other factors like homestead exemptions, the Longtime Owner Occupant Program, and abatements. In our discussions with OPA, they acknowledged that their job is to correctly assess Philadelphia properties and that any policies that alter the tax incidence of those assessments is up to City Council.

Analysis of Assessment Quality and Its Relationship to Neighborhood Demographics

Creation of Two Databases for the CLS Tax Project 2023 Analysis: OPA Sales and Reinvestment Fund Sales

The first and most critical issue for evaluating property tax assessments is collecting the right sales data to compare to the assessments. The sales data must be arm's-length, market value transactions so that assessments are compared to actual market values.²⁰ This is not as straightforward a question as one might imagine, however, and the choices about what sales are included (and excluded) both in the valuation model and evaluation of the results of that model have a high potential for variation and systemic bias.²¹ In our 2021 Report, we identified over-exclusion of sales data as a potential source of bias in OPA's assessments (while OPA argued we had been overly inclusive in the sales data used in our study).

For this study, OPA provided Reinvestment Fund and CEPA with their data file of validated sales transactions (herein, **OPA Sales**). Reinvestment Fund and CEPA created a parallel set of sales transactions from publicly available data (herein, **Reinvestment Fund Sales**), described below, to compare to OPA Sales. Both datasets are used to evaluate the accuracy, uniformity, and potential socioeconomic bias of the 2023 assessments, highlighting how the choice of dataset can significantly affect the results. Comparing differences in results from the two sales files demonstrates how the sales that OPA chose to include or exclude from their own modeling and evaluation process may have influenced the resulting assessments, and if so, in what ways.²² Equally as important, using the two datasets highlights the importance of public transparency in deciding what data will be included and excluded in any ratio study. And, finally, using the two datasets also shows that *even when we relied on OPA's own data, evidence of systemic bias in residential assessments remains*. At the end of the day, there is a demonstrable systemic problem that the City must address.

Reinvestment Fund and CEPA created the dataset "Reinvestment Fund Sales" by collating a database of tax assessments, real estate transactions, and property records, and demographic data from multiple sources including OPA, the Philadelphia Department of Records (via OpenDataPhilly), City Council, and the American Community Survey. Reinvestment Fund thoroughly cleaned²³ the resulting dataset to produce a file that could be used to independently

²⁰ See IAAO, "Standard on Verification and Adjustment of Sales: A criterion for measuring fairness, quality, equity and accuracy." Section 5.1: IMPORTANCE OF SALES VERIFICATION. Approved April 2020. Available at: https://www.iaao.org/media/standards/Verification_Adjustment_of_Sales.pdf. Accessed 8/17/2023.

²¹ See Keene, Kevin, "Racial and Social Equity in Assessments Part 1", (available at: <https://keenemac.com/racial-and-social-equity-in-assessments-part-1>). Accessed 8/14/2023, stating, "Sales validation is a complex process which is not easily automated, and unfortunately, is a subjective process that is especially susceptible to human bias."

²² Decisions about the "right" sales are complicated and technical, but also of fundamental importance to the resulting valuations or analysis of those valuations, and so the topic is discussed in greater depth in "Other Issues Related to Selecting/Rejecting the Appropriate Sales on Which To Base Assessments" on page 33 below.

²³ Data "cleaning" refers to the process of finding and correcting incorrect records, removing duplicate entries, editing records for consistency, formatting data for use in statistical programs and for mapping, formatting data correctly (e.g., converting

evaluate the 2023 assessments.²⁴ For each property that was sold from 2016 through 2020, Reinvestment Fund created a record of the sale date and price, OPA's 2023 final assessment, the Census tract and associated demographic data, the OPA Zone, and real estate transfer information (e.g., grantors, grantees, deed type, etc.).

From these base data, Reinvestment Fund then excluded sales that were apparently not "arms-length transactions". Excluded sales were sales records showing:

- Sheriff Deeds,
- Land Bank Deeds,
- bulk sales of multiple parcels in the same transaction,
- transactions in which the City or a City agency was the buyer or seller,
- sales involving a trust or estate as either buyer or seller,
- transactions between persons with the same surname,
- sales with building permits taken out for the property at any time after the sale (i.e., where the building condition may have changed between the sale and the assessment date),
- initial sales in a pair of transactions with an increase in sale price of 100% or more (i.e., evidence of "flipping" activity that may not be captured in official building permit data), and
- properties that sold for less than \$10,000 or more than \$5,000,000.

Sale prices were adjusted for time using the Time Adjustment Factors provided by OPA to replicate the method OPA used for adjusting sale prices to the assessment date.²⁵ Reinvestment Fund also removed sales with either the lowest or highest 5% of ratios to further provide the benefit of the doubt to OPA (i.e., the 10% of sales furthest on the ends of the distribution of ratios).²⁶ The purpose of this exclusion (also known as "trimming"), is to de-emphasize the impact of extraordinary values²⁷ on the measures that comprise a ratio study. We believe that the resulting dataset is the fairest way to evaluate OPA's 2023 assessments with publicly available data.

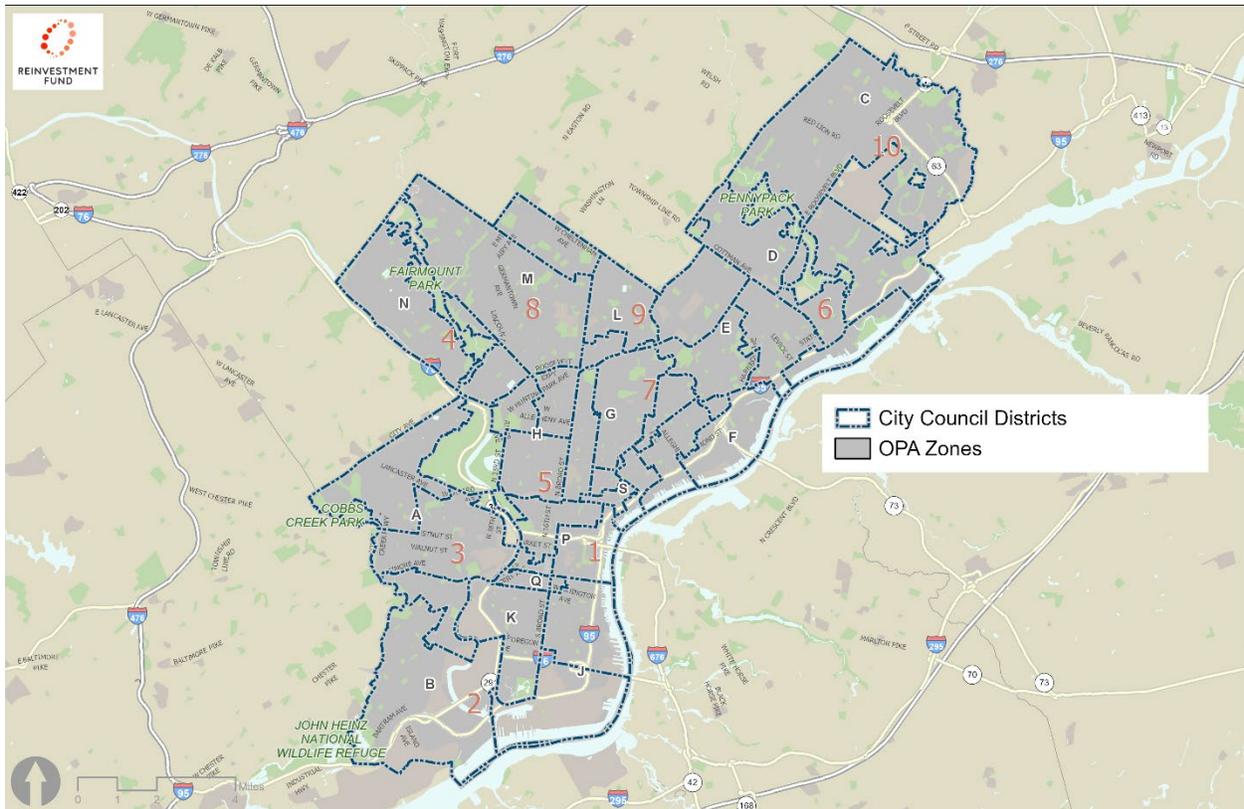
dates from text or numbers to a standardized date format), and a variety of other activities with the goal of creating a standardized, consistent dataset. *See e.g., Wickham, Hadley and Garrett Golemund. 12: Tidy data. R for Data Science. January 2017. (Stating, "Tidy datasets are all alike, but every messy dataset is messy in its own way.")*

²⁴ Reinvestment Fund extracted residential properties up to and including four units. Also removed were Air Rights, Condo Parking Spaces, and Condo Storage Units, even though they carry the administratively assigned "residential" category code.

²⁵ Adjusting sale prices, which occur anywhere from one to five years before the certified assessment date, to the certified assessment date is necessary to accurately compare sale price to assessments for the purposes of a ratio study. Because this process too involves many decisions by the assessor or researcher seeking to evaluate assessments, we chose to use the time adjustment factors provided by OPA to replicate OPA's process as nearly as possible for Reinvestment Fund Sales. *See e.g., "Adjusting sales data for time", from Keene note 17 above, for discussion on the assessor/researcher degrees of freedom available in time adjustments.*

²⁶ *See* IAAO, *Standard on Ratio Studies, Appendix B. Outlier Trimming Guidelines*, page 53, (available at: https://www.iaao.org/media/standards/Standard_on_Ratio_Studies.pdf). Accessed 10/3/2023.

²⁷ IAAO refers to these extraordinary values in its guidance as "influential sales", and trimming is one way of handling said values.



Map 1: OPA Zones and City Council Districts

The Legal Standard

OPA has stated that it establishes a market value for each property that is consistent with the Pennsylvania Supreme Court’s definition, which is: “the price in a competitive market a purchaser, willing but not obligated to buy, would pay an owner, willing but not obligated to sell, taking into consideration all legal uses to which the property can be adapted and might reasonably be applied.”²⁸ This is more commonly called an arm’s length value.

The legally mandated assessment ratio in Philadelphia has been set at 100% of the arm’s length value since 2014, and therefore the ratio of the market value and the assessed value should be 1:1. Stated differently, the market value of a property and the tax value assessed by OPA are supposed to be the same by law.²⁹

²⁸ <https://www.phila.gov/departments/office-of-property-assessment/faq/>.

²⁹ Philadelphia Code § 19-1308. Assessment Ratio. “(1) ... For assessments returned by the Office of Property Assessment in the year 2013 and thereafter, the Established Predetermined Ratio, to be used by the Office of Property Assessment in determining the assessed value of real property, shall be one hundred percent (100%).”

Accuracy: Do the assessed values typically match sale prices? Accuracy is generally evaluated with the **median ratio** of assessed value to sale price. The median is the middle value when all ratios are arranged from lowest to highest.

Uniformity: How much variation is there in the ratios? Put another way, how much does the ratio for any randomly selected property differ, on average, from the median ratio? Uniformity is measured with the **coefficient of dispersion (COD)**.³⁰

Price-Related Regressivity: Are lower valued properties over assessed relative to higher valued properties? One commonly used measure to answer this question is the price-related differential (PRD).³¹ The IAAO refers to PRD as a measure of vertical equity, or of “regressivity or progressivity” with respect to price. A PRD above 1.00 shows that the owners of lower value properties are paying a proportionately higher amount of property taxes than the owners of high valued properties.

Accuracy: Median Ratio

The ratio of valuation to sale price, or the assessment ratio, is the basic measure of assessment accuracy.³² A ratio of 1.0, indicating that the sale price and assessed value are the same, shows that the property is correctly assessed. For any group of properties, the median ratio, that is, the middle value when the ratios are ordered from lowest to highest, should be near 1.0.³³

Citywide in Philadelphia, the median ratio is 1.01 calculated with Reinvestment Fund Sales and 0.99 with OPA Sales, showing that assessments in Philadelphia are grouped around the correct level. The median, or typical, taxpayer can feel confident they could sell their house for approximately their assessed value.

Figure 1, below, provides a visual presentation of assessment accuracy and introduces the concept of variation around the median. The graph shows sale prices along the horizontal axis and valuations across the vertical axis. Each dot is a residential property sale in Philadelphia that took place from 2016 to 2020 (with its price adjusted to 2023), matched to its 2023 assessment. The dots in the graph of Reinvestment Fund Sales have a sharp boundary because we edited out the most extreme ratios.

³⁰ The coefficient of dispersion (COD) is calculated as the mean absolute difference between each ratio and the median ratio; divided by the median ratio. A COD of 5 indicates that assessments are, on average, 5% above or below the actual value.

³¹ PRD is the average, or mean, ratio divided by the mean of the ratios weighted by sale price. The denominator in this fraction tends toward the ratios for higher valued properties so, for example, if higher valued properties are more likely than others to have lower assessment ratios, PRD will exceed 1.00.

³² See IAAO note 1 *supra* at page 8.

³³ *Id.*

The red dashed line shows where sale prices and valuations are equal and valuations are therefore accurate. The blue line is the actual average ratio as sale prices vary. The lines are similar for both datasets – showing that, at least if we look only at averages, properties tend to be accurately assessed.

The blue line is higher than the red line for lower sale prices – indicating that the assessments for those properties are too high on average (i.e., lower priced properties are over assessed). Conversely, the blue line is below the red line for higher priced properties – indicating that the assessments for those properties are too low on average (i.e., higher priced properties are under assessed). We will say more about this later and also discuss the differences between actual assessments (the black dots) and the averages (the lines) in the graph.

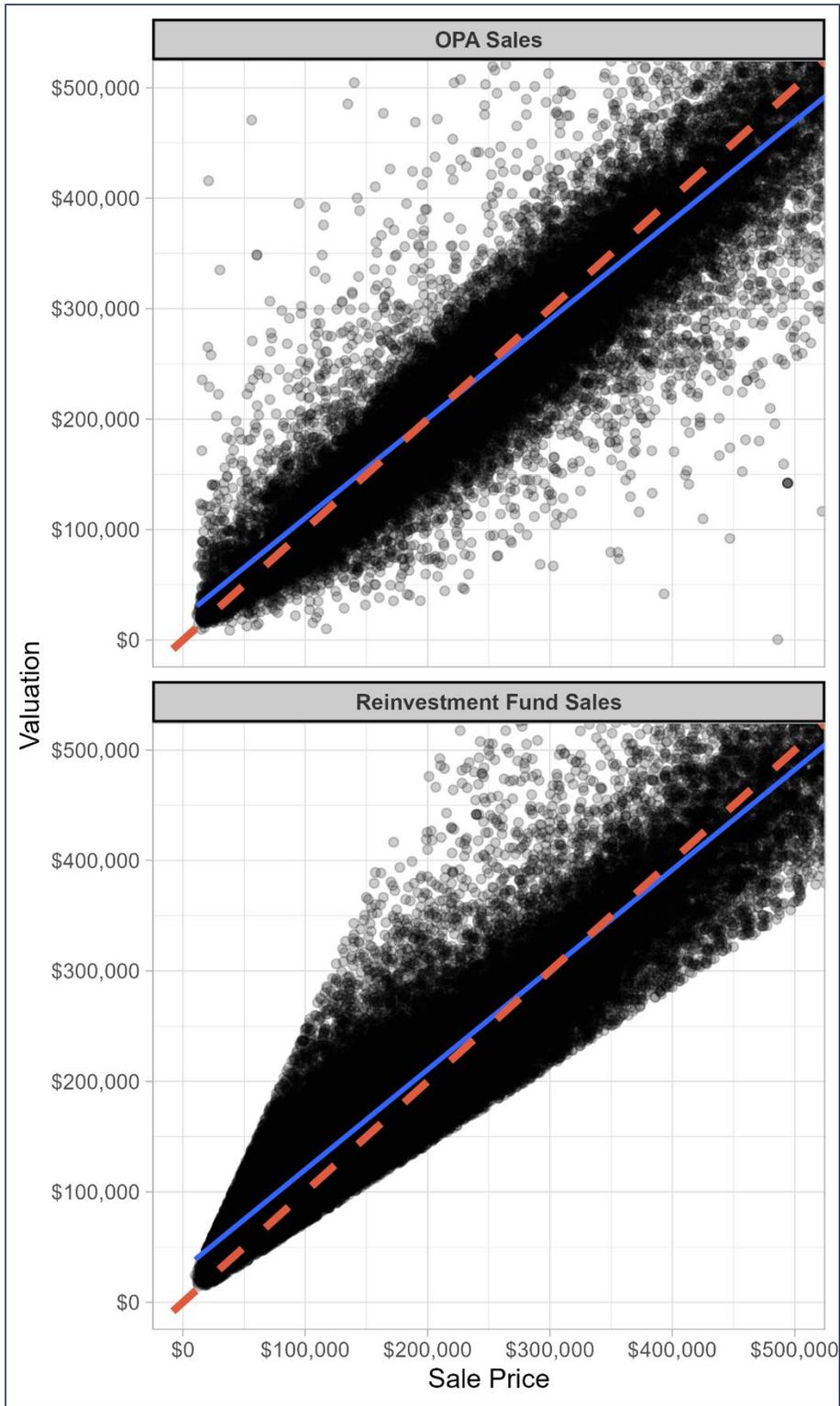


Figure 1: Citywide Valuation Compared to Observed Sale Price for both OPA Sales and Reinvestment Fund Sales

Residential valuations are *generally* consistent with market values across the city of Philadelphia. However median assessment ratios vary between OPA Zones. OPA Zones are shown in Map 1 (above); median ratios by Zone are displayed in Figure 2 and Maps 2 and 3 below. There are sixteen zones total, and OPA labels them alphabetically. The median ratio for valuation to observed sale price ranges from 0.98 in Zone Q (Graduate Hospital) to 1.17 in Zone B (Southwest Philadelphia) using Reinvestment Fund Sales. That is, the Zones ranged from close to correctly assessed in some parts of Philadelphia to unacceptably over assessed in Zones B (Southwest Philadelphia), G (North Philadelphia East), and H (North Philadelphia West). OPA Sales also show variation in the median ratio, ranging from unacceptably *under assessed* in Zone H (North Philadelphia West) and B (Southwest Philadelphia) to correctly assessed in other parts of the city. In many areas, the datasets agree that the median home assessment is within the IAAO acceptable range. In parts of North and West Philadelphia, however, both datasets show that the median assessment is not within industry standards. OPA Sales indicate that those places are unacceptably *under assessed*, while Reinvestment Fund Sales instead show that those places are unacceptably *over assessed*.

These differences are due to differences between which sales were included in OPA Sales and Reinvestment Fund Sales. This highlights the importance of transparency in the data used in ratio studies – the choice of data used clearly affects what we learn about the accuracy of assessments throughout the city. Regardless of which dataset is used, the evidence shows that:

- In many Philadelphia neighborhoods, the degree of under or over assessment for the median property is within professional standards set by the IAAO.
- Property owners in Zone H (North Philadelphia West) and Zone B (Southwest Philadelphia) do not have the same certainty that their assessments are accurate. They may be significantly either over assessed or under assessed by OPA.

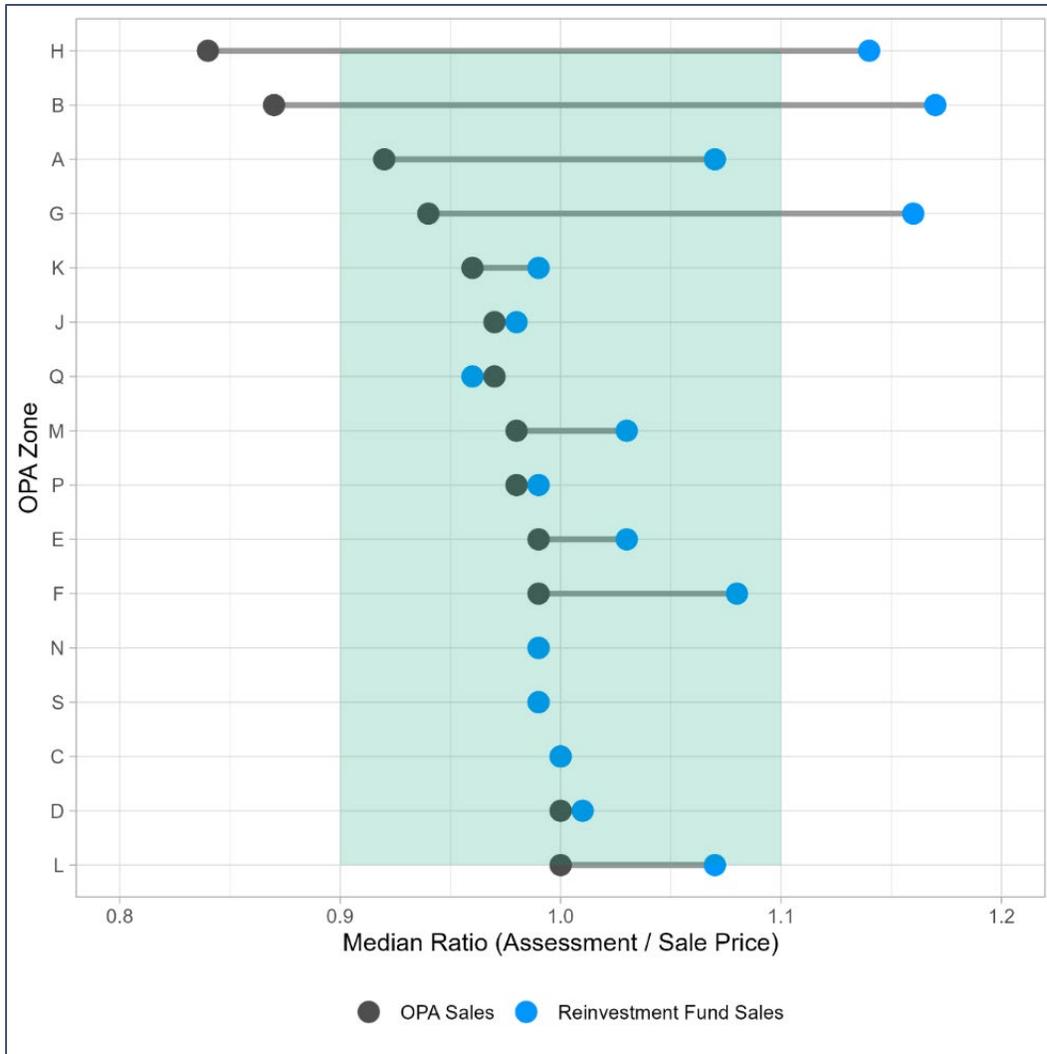
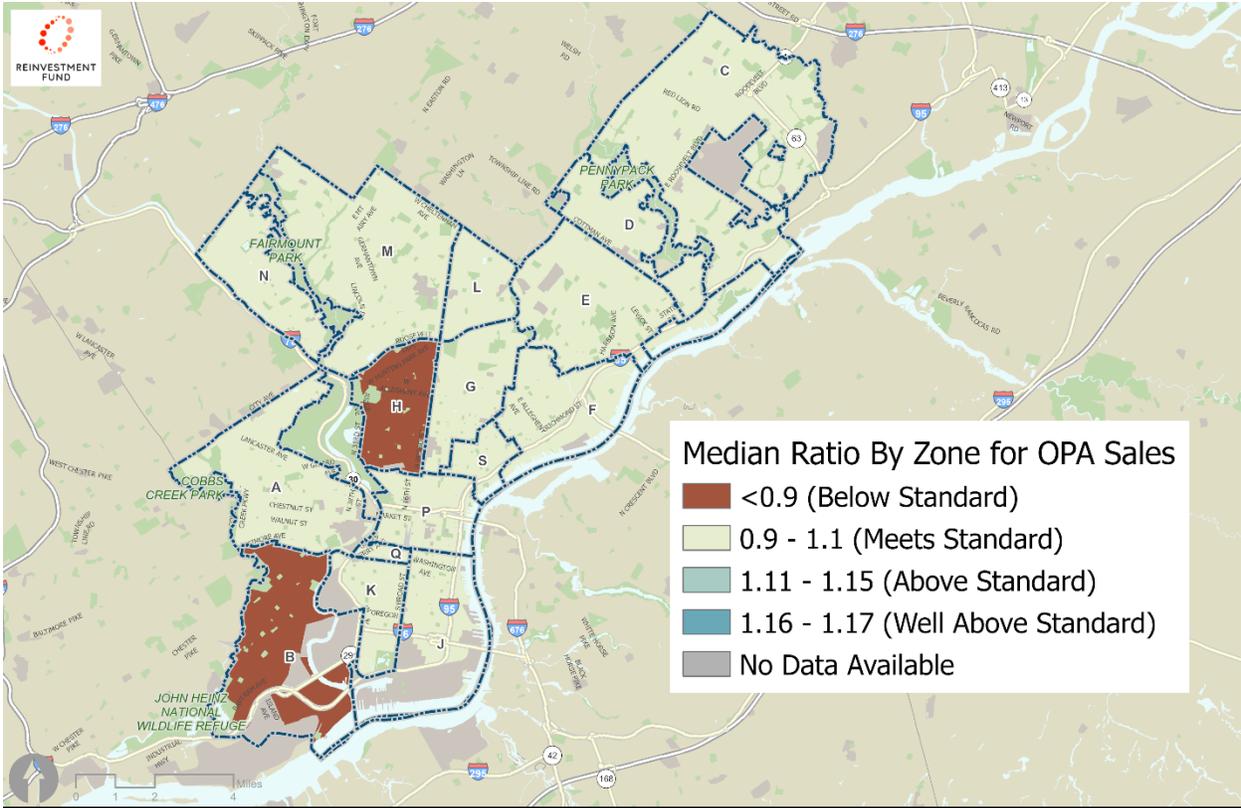
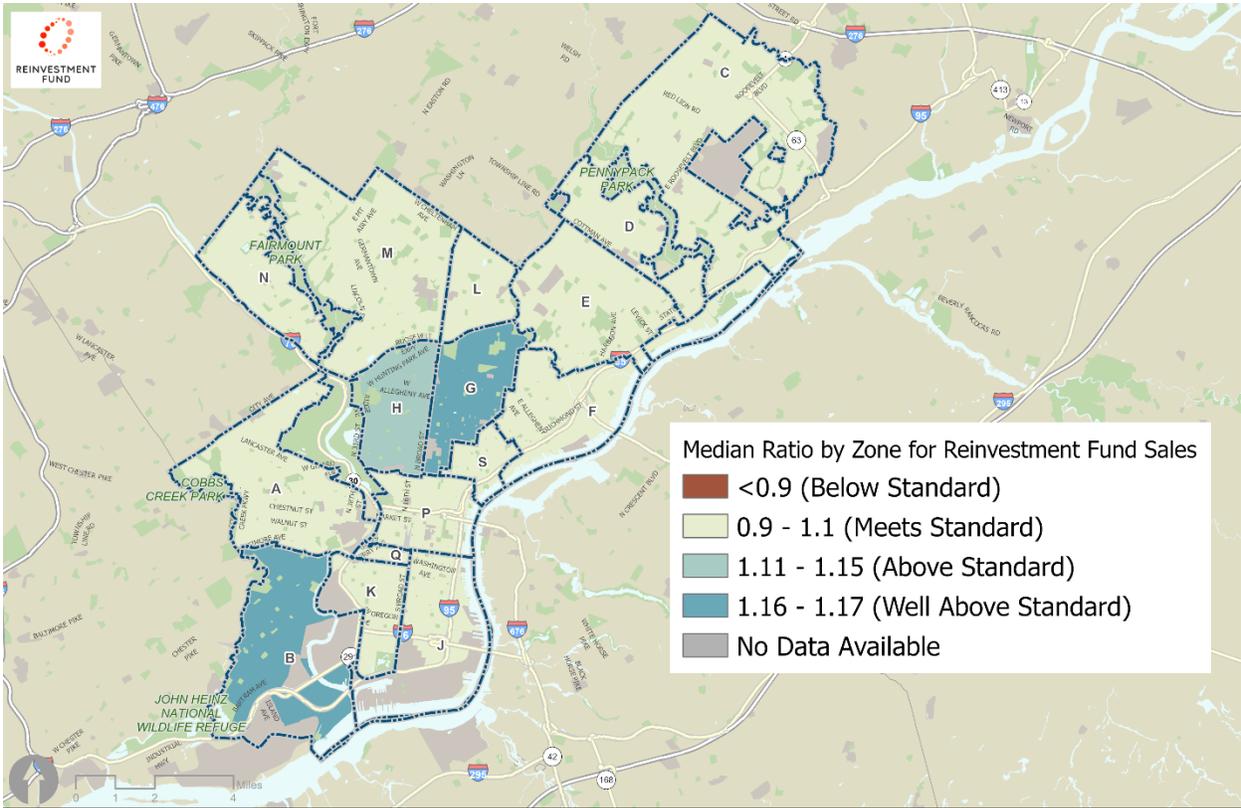


Figure 2: Median Ratio of Assessment to Sale Price by OPA Zone [The aqua-colored rectangle is the generally acceptable range according to IAAO standards.]³⁴

³⁴ See *supra* IAAO note 1 at page 8.



Map 2: Median Ratio by OPA Zone for OPA Sales. [Light khaki areas meet the IAAO standard.]



Map 3: Median Ratio by OPA Zone for Reinvestment Fund Sales. [Light khaki areas meet the IAAO standard.]

Uniformity: Coefficient of Dispersion (COD)

Tax assessment valuations will never be 100% perfect and neither the law nor the IAAO expects them to be. However, IAAO does propose an upper limit on the amount of variation in good assessment systems. This limit is expressed in terms of COD. COD is the average difference between each individual observation and the median, expressed as a percent of the median. If the median value in a particular set of data is 100 and the average difference between each data point and 100 is 15,³⁵ the COD is 15 divided by 100, or 15%, which is often simply stated as 15. Generally speaking, about half or slightly more of all ratios will be closer to the median than the COD, and half or slightly fewer will be farther away.

COD measures the amount of variation but not the direction. That is, when the COD is high, assessments are unfair in both directions (under and over assessed in relation to the median). Some people are paying too little in taxes while others down the block pay more than their fair share.

IAAO says that the COD for residential properties should be at or below 15%, but rarely will be under 5%.³⁶ Figure 3, below, overlays a yellow cone on the plot of sale prices and valuations. This cone illustrates a 15% variation, or the maximum acceptable COD range. The cone expands as prices increase because the COD is a percent. For example, if properties worth \$100,000 are assessed within 15% of their value, their assessments will be between \$85,000 and \$115,000, a spread of \$30,000. Properties worth \$400,000 will be assessed between \$340,000 and \$460,000, a spread of \$120,000.

With good assessing, at least half of all dots will fall into this cone and the other half will be close to it. Generally, that is not the case for either dataset. Many lower priced properties are well outside the cone, especially on the high side (over assessed). Similarly, higher priced properties, despite their larger tolerable range of variation, fall outside the cone.

³⁵The sign of the difference is ignored in the calculation of COD. In the example above, values of 120 and 80 would each contribute +20 to the computation of the average variation. Data points exactly at the median are included, with each contributing a value of 0 to computation of the average.

³⁶ IAAO states that COD values under 5% for single family residential properties in older or more heterogeneous areas “may indicate sales chasing or non-representative samples”. See *supra* IAAO, “Standard on Ratio Studies” note 1.

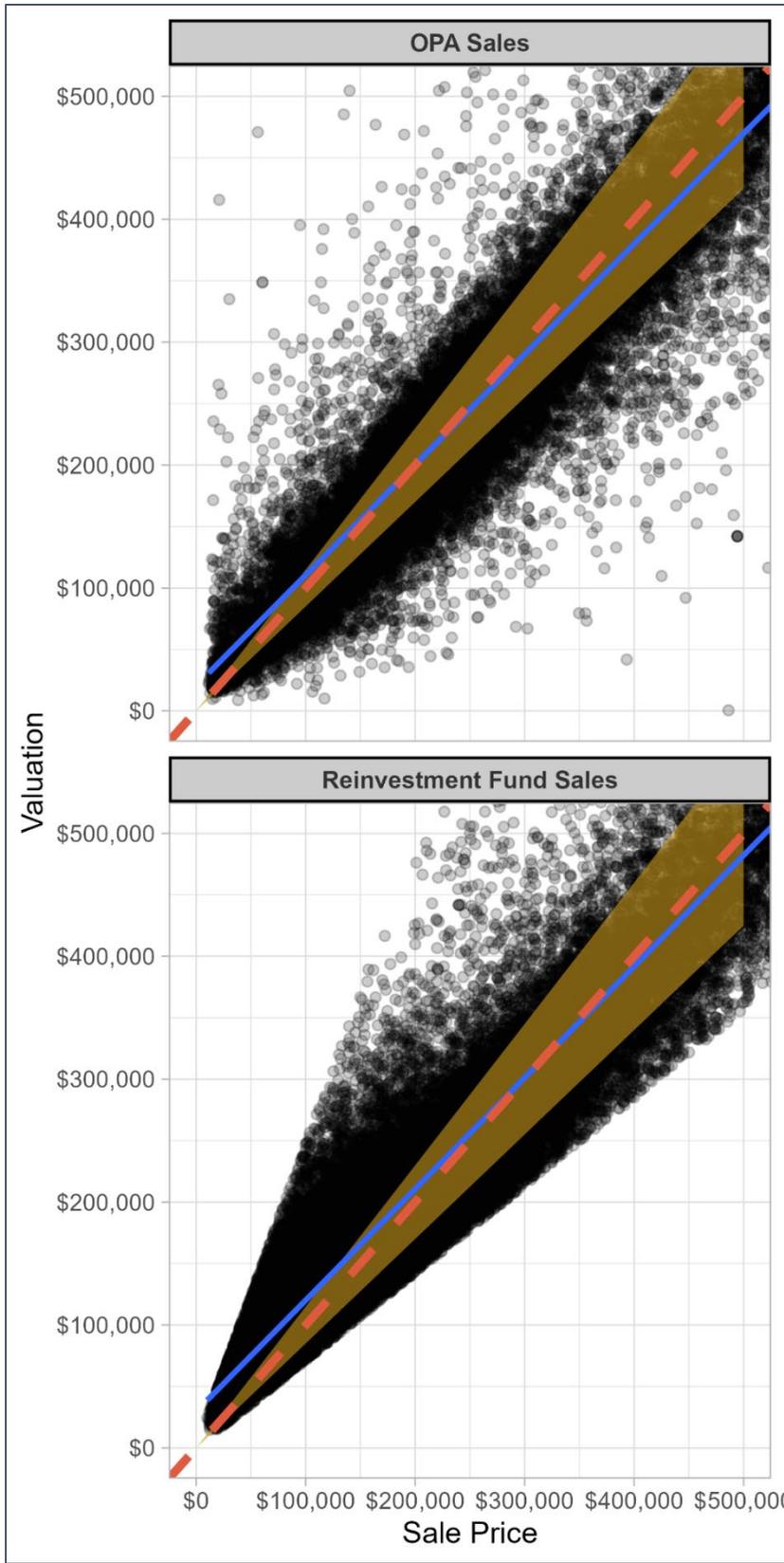


Figure 3: Citywide Valuation Compared to Observed Sale Price for both OPA and Reinvestment Fund Sales

Figure 4 and Maps 4 and 5 below show that this variation is concentrated in particular neighborhoods. Zones H [North Philadelphia West] (COD of 37% in the OPA dataset and 31% with the Reinvestment Fund dataset), G [North Philadelphia East] (31% with OPA data and 32% with Reinvestment Fund), B [Southwest Philadelphia] (24% with OPA data and 31% with Reinvestment Fund), and A [West Philadelphia] (22% with OPA data and 29% with Reinvestment Fund) are well outside the acceptable range in both datasets – up to almost 40% depending on which dataset is used.

In Zones P (Center City) or S (Fishtown) the degree is quite low – roughly 10%. In Zones B (Southwest Philadelphia) and H (North Philadelphia East), among others, the degree is quite high – ranging from 25% up to almost 40% depending on which dataset is used for measuring. Put another way, a homeowner in Zone P with a home that could sell for \$100,000 can expect that their assessment could range from \$90,000 to \$110,000. A homeowner in Zone H with a similar home can expect instead that their assessment could range anywhere from \$60,000 to \$140,000.

The COD makes clear that inaccurate assessments can go in either direction, that is, an assessment much higher than their properties' market value or an assessment that is much lower. Stated differently, the higher the COD the greater the risk of having an inaccurate assessment. A homeowner in Zone H could get quite a large discount on their assessment or quite a large extra tax burden. While a large COD may seem to benefit some homeowners, it harms others. It unfairly distributes taxes but provides no change in total tax revenue. The overall impact may be decreased trust in the system, making it more difficult for City Council members to manage the City's finances.

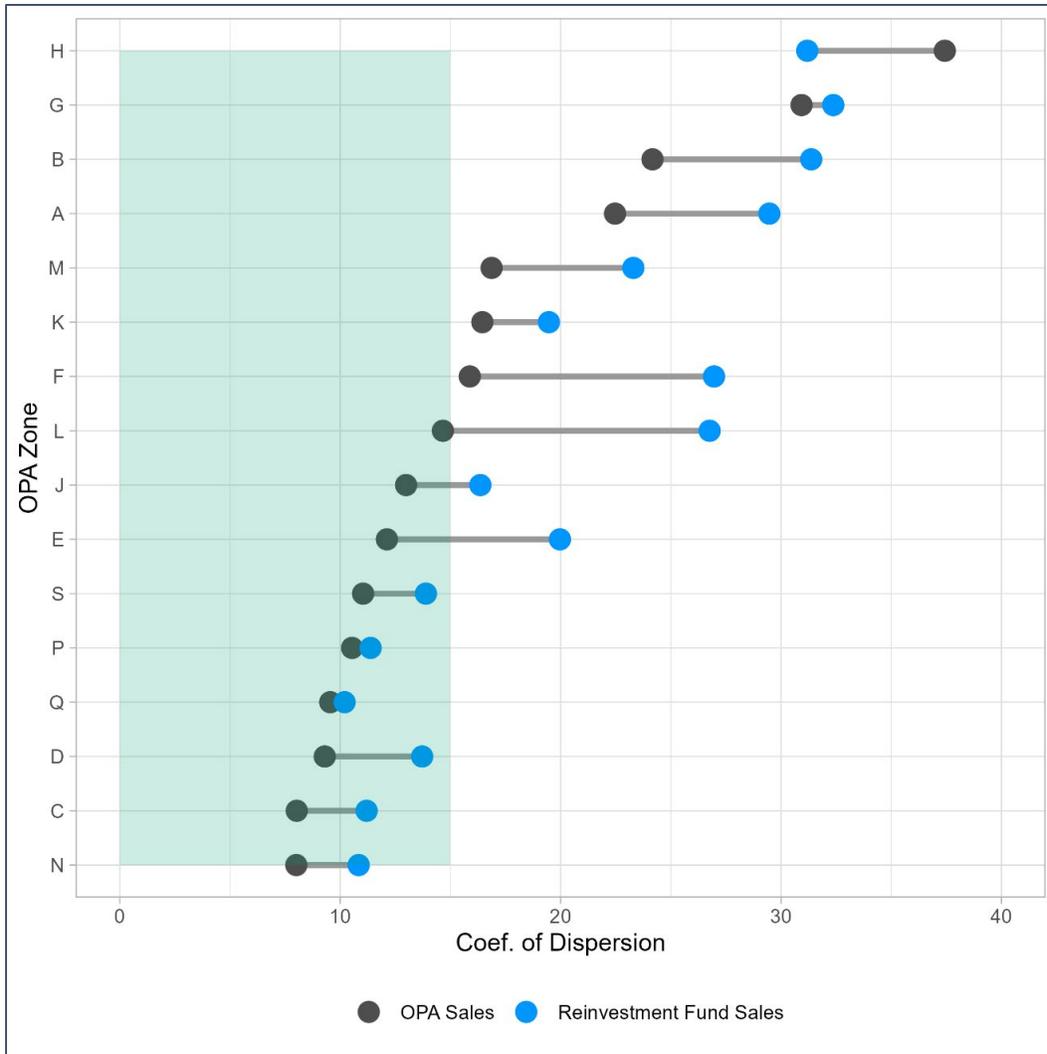
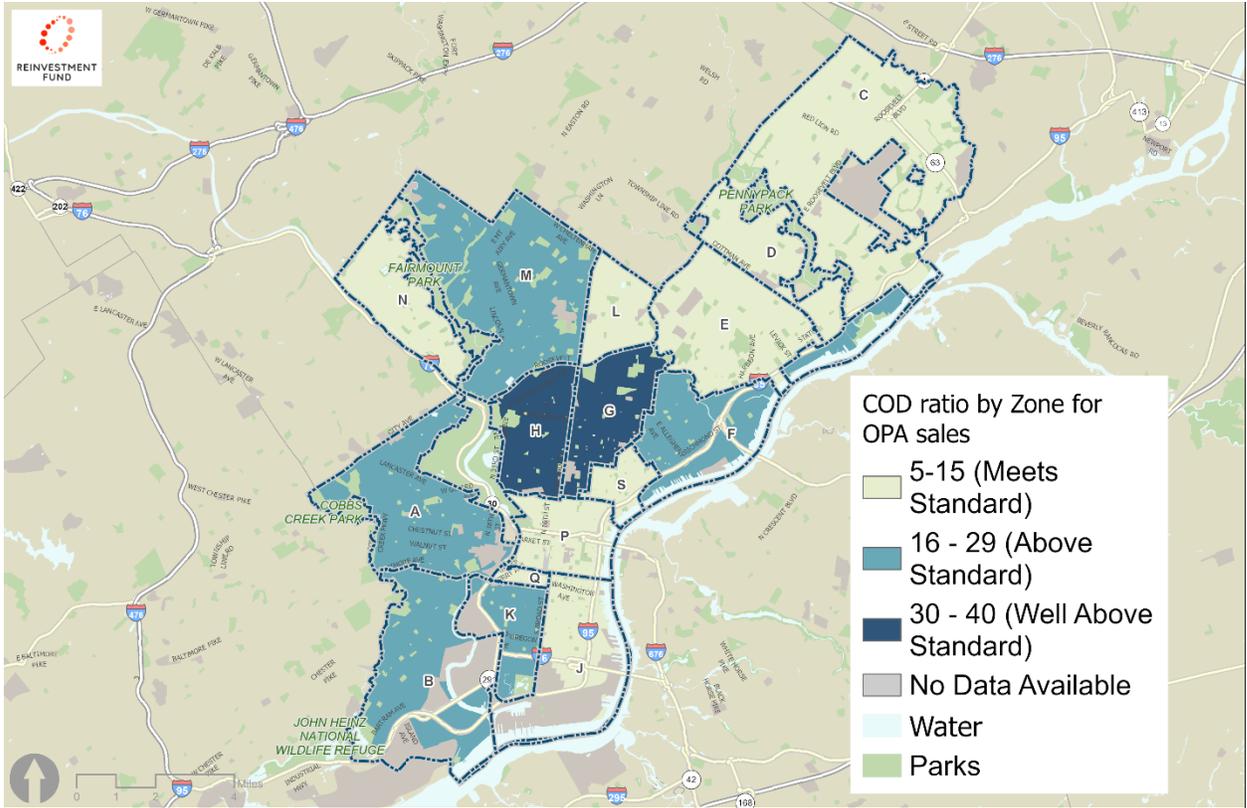
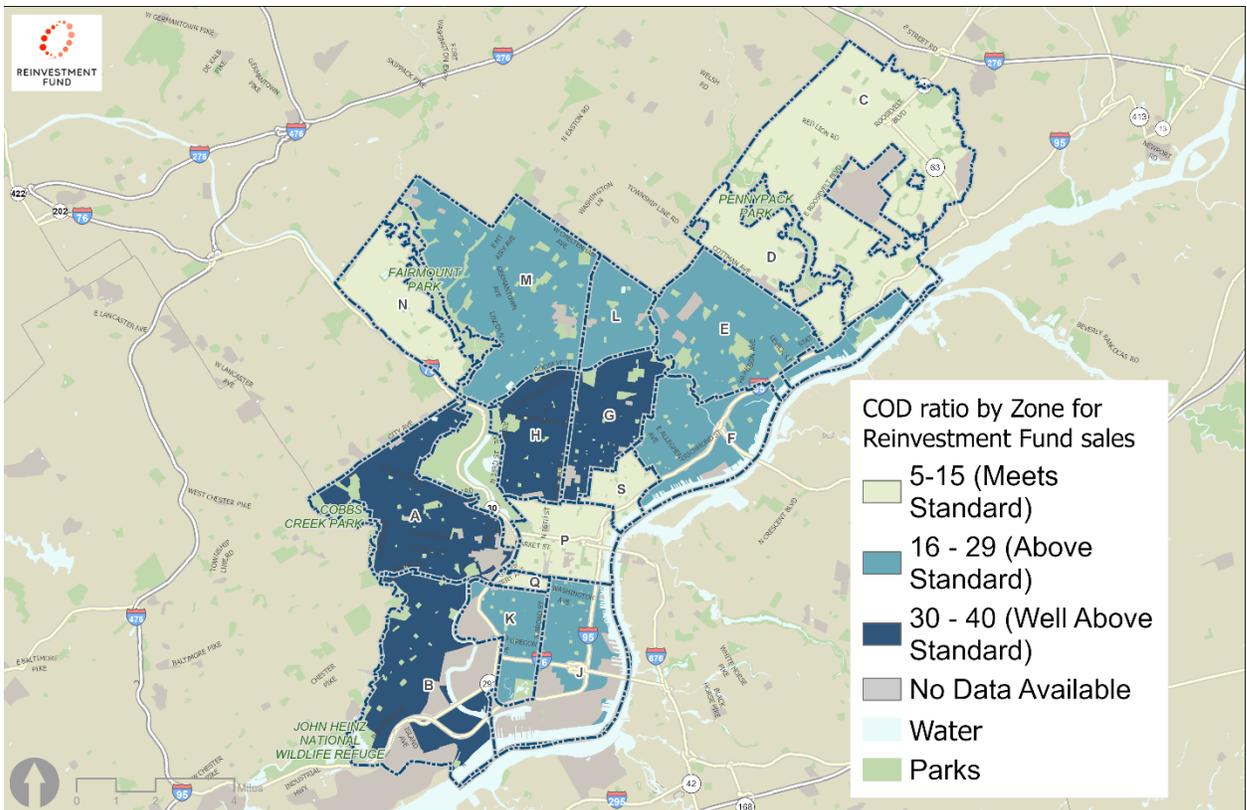


Figure 4: COD by OPA Zone [The aqua-colored rectangle is the generally acceptable range established by the IAAO.]



Map 4: COD by OPA Zone for OPA Sales. [Light khaki areas meet the IAAO standard.]



Map 5: COD by OPA Zone for Reinvestment Fund Sales. [Light khaki areas meet the IAAO standard.]

Regressivity Related to Price: Price-Related Differential

The Price-Related Differential (PRD) measures a particular form of regressivity - the extent to which low price properties are over or under assessed compared to higher priced properties. A PRD of 1.00 shows that all properties, regardless of value, tend to be assessed at the same ratio, while a PRD below 1.00 indicates *under* assessment for low value properties and above 1.00 indicates *over* assessment for low value properties.

The generally acceptable range set by the IAAO for tolerable price bias is between 0.98 and 1.03.³⁷ Figure 5 and Maps 6 and 7, below, show that all OPA Zones are above 1.00, even if some are within the range for tolerable regressivity. Two zones are clearly above the range in both datasets: Zones G [North Philadelphia East] (1.15 in OPA Sales and 1.17 in Reinvestment Fund Sales) and H [North Philadelphia West] (1.27 in OPA Sales and 1.14 in Reinvestment Fund Sales). Zones A, B, M, F, K, and L are all slightly above the industry standard when using OPA Sales but well above the standard when measured with Reinvestment Fund Sales.

- For example, a homeowner living in a lower-valued home in Zone C (Far Northeast) will pay roughly their fair share of taxes compared to a homeowner living in a higher-value home also in the Far Northeast. The two homeowners' actual tax bills will not be the same if the homes values are different – but each will be the correct amounts relative to the market of values their respective properties.
- In contrast, in Zone G (North Philadelphia East), an owner of a lower valued property could pay much more on the value of their property relative to the owner of a higher priced property in that area. The owner of the lower value home in Zone G is more likely to be over assessed than their neighbor down the block in a higher value home.

Comparing PRDs to CODs can produce useful insights. A high PRD indicates that low priced properties are more likely to have higher assessment ratios, while a high COD reflects great variation around the median ratio regardless of price. Consider Zones G (North Philadelphia East), H (North Philadelphia West), A (West Philadelphia), and B (Southwest Philadelphia). Each has both a high PRD and a high COD. The high PRD indicates that low priced properties in these zones, on average, have higher assessment ratios than higher priced properties. The high COD suggests that the owners of these properties whose assessment ratio varies above the median are very over assessed indeed. Conversely, the owners of high-priced properties, who begin with lower assessment ratios, if they vary below the median ratio, are extremely under assessed.

³⁷ See IAAO note 1 *supra*.

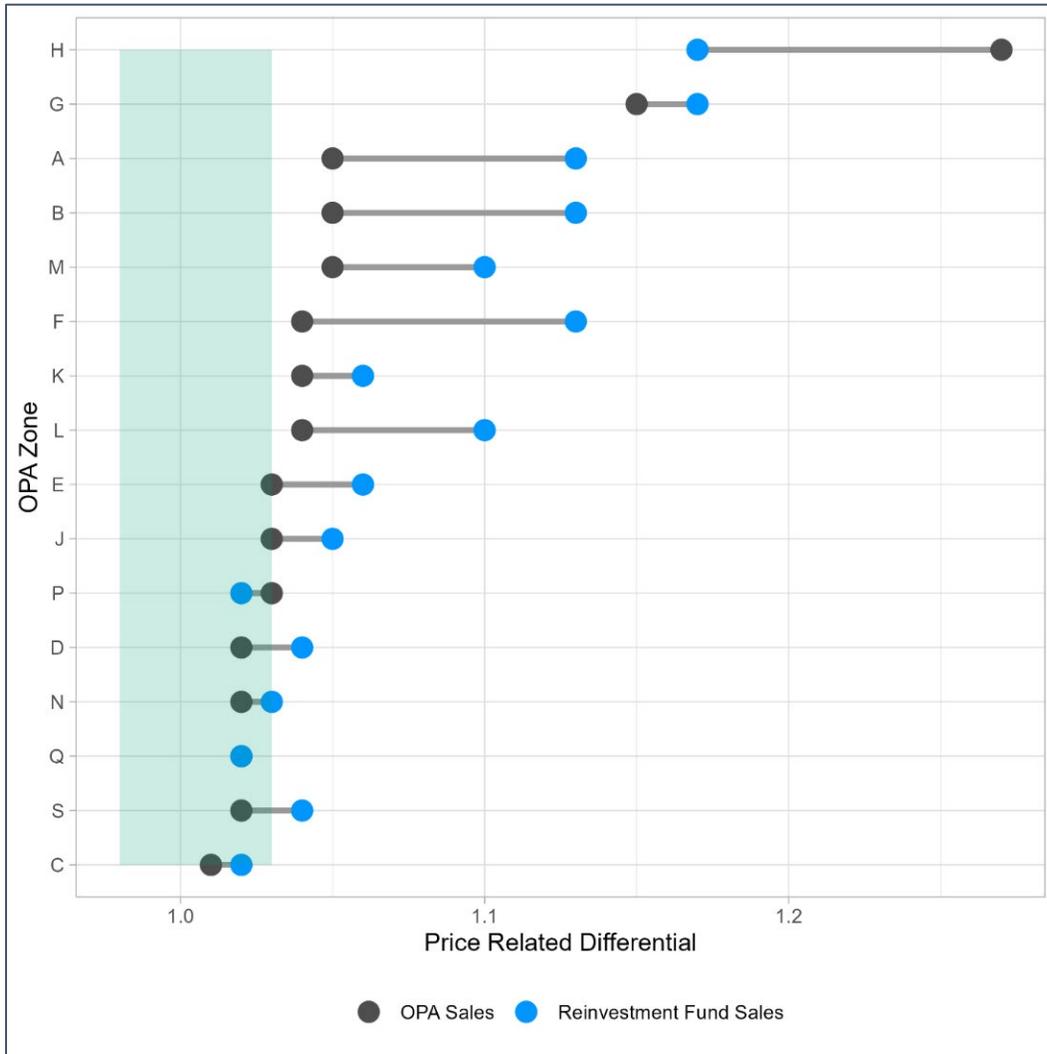
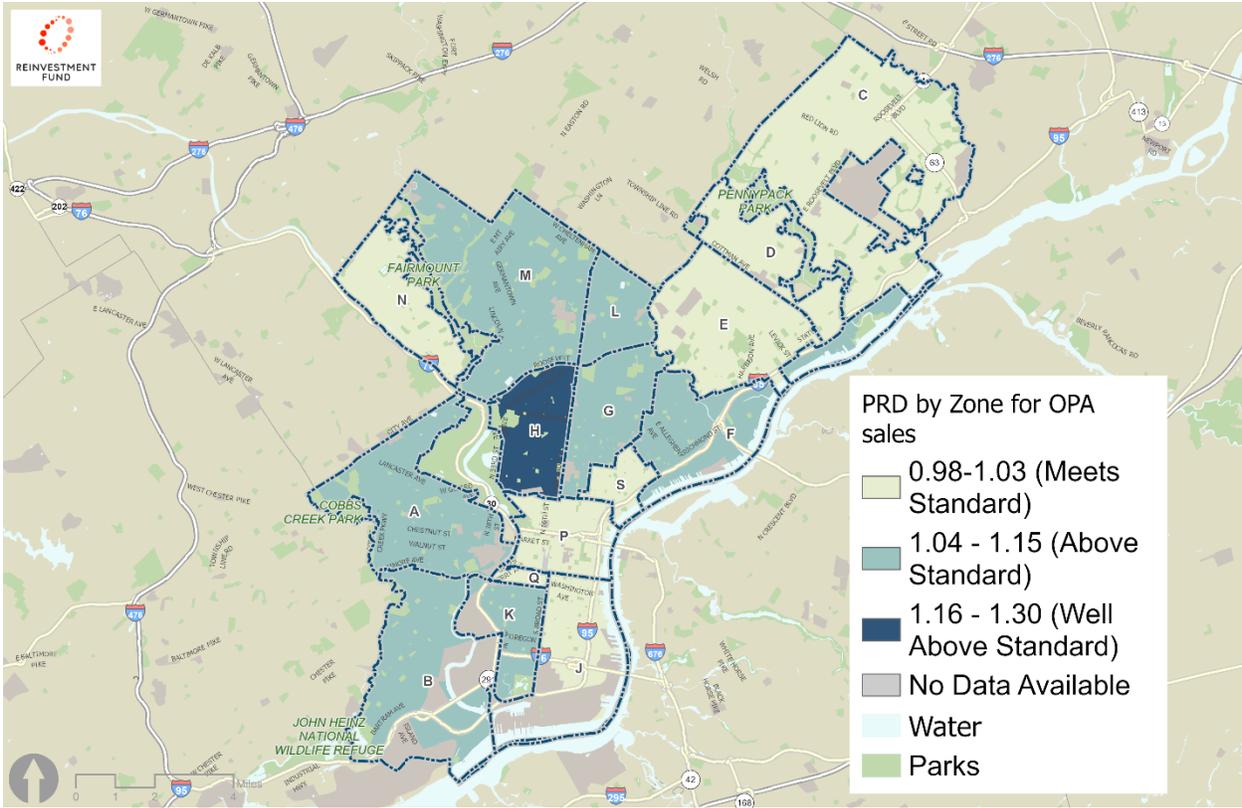
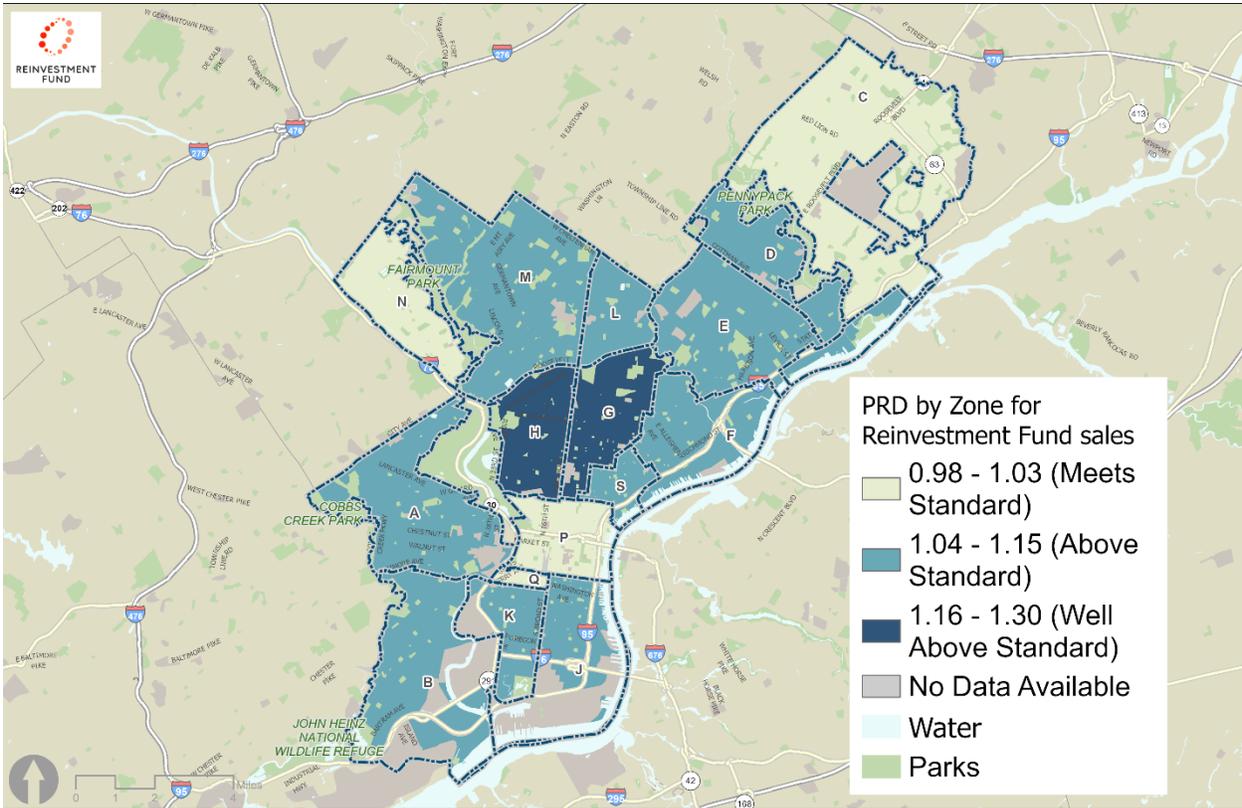


Figure 5: PRD by OPA Zone [The aqua-colored rectangle is the generally acceptable range established by the IAAO.]



Map 6: PRD by OPA Zone for OPA Sales. [Light khaki areas meet the IAAO standard.]



Map 7: PRD by OPA Zone for Reinvestment Fund Sales. [Light khaki areas meet the IAAO standard.]

Demographic Bias: Assessment Quality by Neighborhood Race, Ethnicity, and Income

Our analysis of the three measures of assessment quality: 1) accuracy, 2) uniformity, and 3) regressivity shows that – regardless of which dataset is relied on – there are “hotspot” neighborhoods in Philadelphia in which assessments are well outside of IAAO standards and property owners have good cause to wonder if their assessments are fair. The picture gets even more complex when we look at the demographics of people residing in those neighborhoods where the median assessment ratio, the COD, and the PRD are above industry standards.

Comparing the demographics of residents in OPA Zones with measures of assessment quality shows that:

- People residing in areas that have lower incomes, higher percentages of Black residents, or higher percentages of Hispanic residents are more likely to experience assessment quality problems.
- For example, a residential property in Zone B (Southwest Philadelphia), a neighborhood with a high share of Black residents, is more likely to be inaccurately assessed compared to a similar residential property in Zone P (Center City), a majority White neighborhood.

This is true regardless of the dataset used in the analysis. Table 1, below, demonstrates that OPA Zones with the highest median assessment ratios, COD, and PRD are generally lower income and with high shares of non-White residents.

OPA Zone	Demographics			Median Ratio		Coef. of Dispersion		Price-Related Differential	
	Percent Pop. Black	Percent Pop. Hispanic	Median Household Income	RF Sales	OPA Sales	RF Sales	OPA Sales	RF Sales	OPA Sales
B	83.7%	4.0%	\$36,969	1.17	0.87	31.4	24.2	1.13	1.05
H	77.3%	6.2%	\$29,295	1.14	0.84	31.2	37.4	1.17	1.27
M	73.8%	2.9%	\$53,605	1.03	0.98	23.3	16.9	1.10	1.05
A	70.0%	4.0%	\$35,422	1.07	0.92	29.5	22.5	1.13	1.05
L	64.4%	18.5%	\$39,684	1.07	1.00	26.8	14.7	1.10	1.04
K	32.2%	8.1%	\$55,666	0.99	0.96	19.5	16.4	1.06	1.04
G	29.5%	57.2%	\$21,853	1.16	0.94	32.4	30.9	1.17	1.15
E	29.3%	30.1%	\$45,021	1.03	0.99	20.0	12.1	1.06	1.03
Q	21.0%	4.3%	\$126,137	0.96	0.97	10.2	9.6	1.02	1.02
D	14.9%	15.5%	\$57,048	1.01	1.00	13.7	9.3	1.04	1.02
F	13.6%	43.2%	\$40,860	1.08	0.99	27.0	15.9	1.13	1.04
N	12.0%	6.5%	\$81,870	0.99	0.99	10.8	8.0	1.03	1.02
P	10.5%	6.7%	\$96,935	0.99	0.98	11.4	10.5	1.02	1.03
C	9.5%	8.6%	\$67,000	1.00	1.00	11.2	8.0	1.02	1.01
S	6.3%	16.3%	\$83,620	0.99	0.99	13.9	11.0	1.04	1.02
J	6.1%	13.4%	\$74,104	0.98	0.97	16.4	13.0	1.05	1.03

Table 1: Demographic and Assessment Characteristics by OPA Zone (Sorted by % Black) [Cells shaded red denote problematic ranges of the given indicator exceeding the IAAO standards.]

Looking Closer at Neighborhood Demographics for Evidence of Systemic Bias

OPA Zones are quite large and often include neighborhoods with different demographic characteristics. Statistics calculated at the zone level might therefore mask differences in assessment ratios within the Zone that are correlated with neighborhood demographics. Philadelphia’s 408 Census tracts are much smaller and make it easier to unmask such potential differences. We made three separate rankings of Philadelphia’s residential Census tracts—according to household income, share of residents who are Black, and share of residents who are Hispanic—and then examined deciles³⁸ within each ranking.

Tables 2-4 show the COD, PRD, and median ratio of assessed value to sale price for Census tracts, by dataset. The tables are organized by “deciles” of tracts. A decile is one tenth of

³⁸ A decile is one tenth of whatever one is talking about, with the highest decile having the highest concentration of the ranking factor. For example, the 10th decile of Census tracts ranked by race consists of the one tenth of tracts that have the highest percentages of Black residents; see the first two columns of Table 2.

Philadelphia's 408 Census tracts,³⁹ approximately 40 tracts per decile. Each table lists the deciles from high to low by share of residents who are Black, share of residents who are Hispanic, and median household income, respectively. For example, in Table 2 the deciles are listed by the share of Black residents. Reading across the first row (Decile 10), we see that the one tenth of Census tracts with the highest concentration of Black residents have between 90.3 and 98.9% Black residents. Based on Reinvestment Fund Sales, the median assessment ratio for those tracts is 1.08, their COD is 29, and their PRD is 1.12. Comparable data from OPA Sales are in adjoining columns (0.95, 19, and 1.05, respectively). For comparison, the citywide data (all tracts combined) are in the bottom row and the IAAO target ranges are in the column headings.

The Statistical Evidence of Systemic Neighborhood Racial Bias

Reinvestment Fund Sales show that areas with a higher percentage of residents that are Black tend to have more problems with assessment quality: a higher median assessment ratio, COD, and PRD. With a median assessment ratio above 1.0, homes in these areas are generally over assessed, while an elevated COD and PRD show increased non-uniformity and price-related regressivity. Sales from OPA's dataset similarly show a connection between areas with a higher share of Black residents and an increased COD and PRD. However, the median assessment ratio in OPA Sales data does not exceed 1.0 in any of the deciles, and it seems that areas with a high percentage of Black residents have lower median ratios than areas with a lower share of Black residents. Table 2 shows that overall, the average residential assessment (the "median ratio") in Philadelphia is reasonably accurate. However, the table also shows that when valuations do go wrong – when they are non-uniform (COD) or have price-related regressivity (PRD) – these errors are more concentrated in Black neighborhoods. This is evidence of systemic bias.

³⁹ Non-residential Census tracts have been excluded.

Census Tract Race		Median Ratio 0.9-1.1		Coef. of Dispersion < 15		Price-Related Differential 0.98-1.03	
Race Decile	% Pop. Black	RF Sales	OPA Sales	RF Sales	OPA Sales	RF Sales	OPA Sales
10	90.3 – 98.9%	1.08	0.96	29.0	19.4	1.12	1.05
9	82.5 – 90.3%	1.17	0.93	30.8	26.1	1.13	1.10
8	61.4 – 82.1%	1.05	0.96	27.5	22.3	1.11	1.07
7	41.7 – 60.7%	1.02	0.95	23.2	19.3	1.10	1.07
6	25.1 – 41.3	1.04	0.99	22.9	15.2	1.09	1.04
5	16.1 – 24.9%	1.01	0.98	18.8	13.2	1.09	1.05
4	10.2 – 15.8%	1.02	0.99	17.8	11.2	1.07	1.03
3	5.4 – 10.1%	0.99	0.99	13.5	11.0	1.04	1.03
2	1.7 – 5.2%	0.99	0.99	14.0	10.5	1.05	1.02
1	0.0 – 1.7%	1.00	0.99	15.7	10.5	1.04	1.02
Philadelphia	39.7%	1.01	0.99	20.6	14.8	1.09	1.04

Table 2: Median Ratios, COD, and PRD by Census Tract Percentile Black Residents Decile

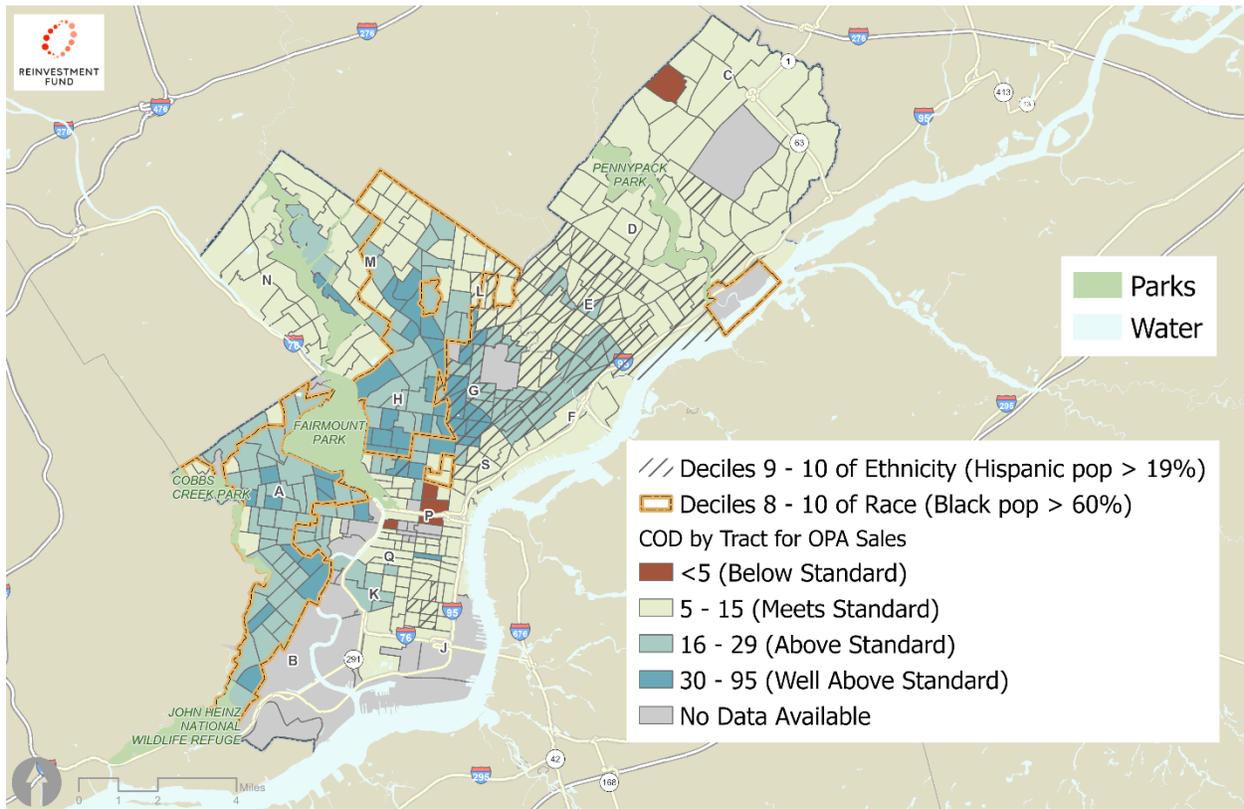
The Statistical Evidence of Systemic Neighborhood Ethnic Bias

Table 3 and Maps 8 through 11, show that the Census tract decile with the very highest concentration of Hispanic residents (more than 37%) has problems with assessment quality similar to the problems in Black neighborhoods. These tracts have a relatively high median assessment ratio (with Reinvestment Fund Sales), COD, and PRD (with both datasets). These assessment quality issues are well above citywide figures. The nine deciles with lower concentrations of Hispanics are closer to citywide figures. OPA Sales show a different picture, with tighter conformity to citywide figures in most deciles (although still elevated COD and PRD in the areas with the most Hispanic residents, like Logan and Frankford).

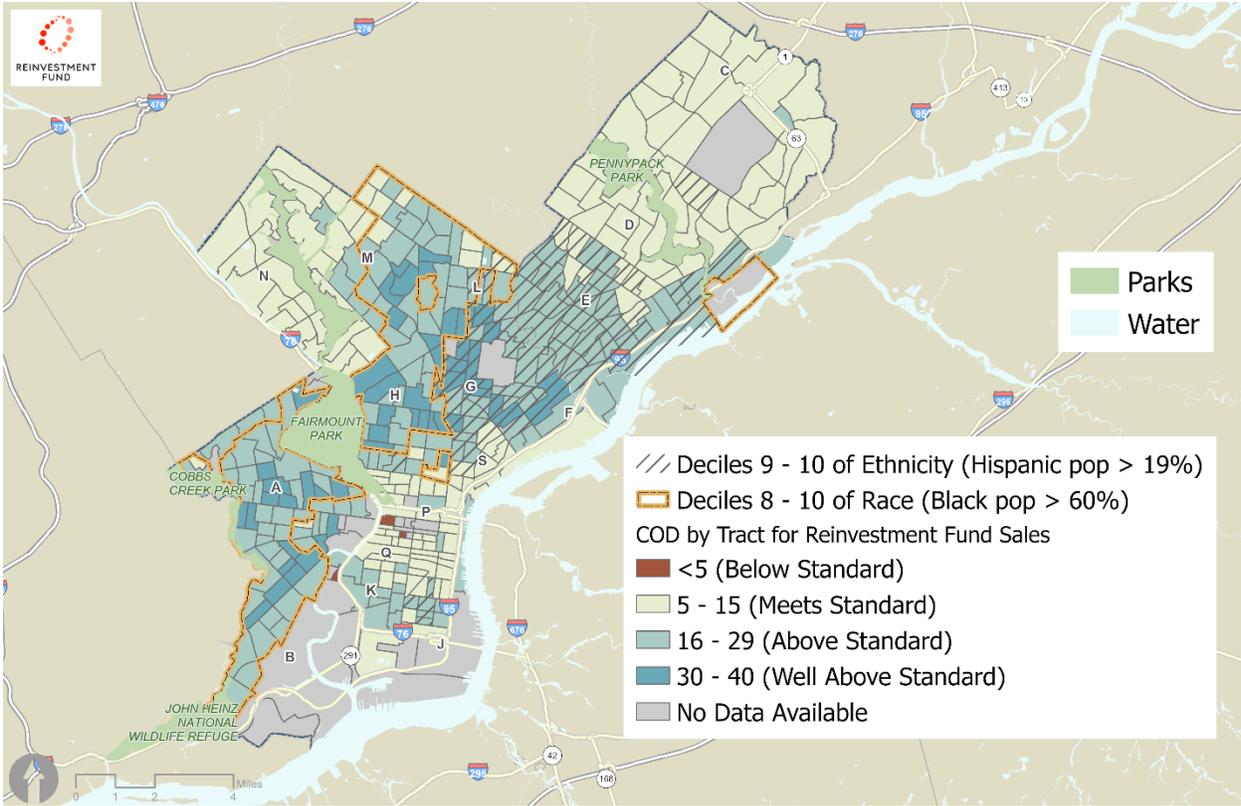
For property owners in areas with the highest shares of Hispanic residents, such as North Philadelphia East and the Oxford/Mayfair neighborhoods, this means that they are more likely over assessed and therefore they are paying more in property taxes than owners of similar properties in other parts of Philadelphia. Even the median owner in these areas looks over assessed (using Reinvestment Fund’s Sales) compared to any other area of the city. Predominately Hispanic areas have more issues with assessment quality therefore than other areas in Philadelphia.

Census Tract Ethnicity		Median Ratio 0.9-1.1		Coef. of Dispersion < 15		Price-Related Differential 0.98-1.03	
Ethnicity Decile	% Pop. Hispanic	RF Sales	OPA Sales	RF Sales	OPA Sales	RF Sales	OPA Sales
10	37.4 – 91.7%	1.11	0.98	29.4	21.0	1.13	1.08
9	19.4 – 36.7%	1.03	0.99	20.4	12.8	1.07	1.03
8	11.6 – 19.3%	1.01	0.99	15.8	11.7	1.05	1.02
7	8.1 – 11.6%	1.00	0.99	15.0	12.3	1.05	1.03
6	6.3 – 8.0%	0.99	0.97	15.7	12.7	1.06	1.03
5	4.8 – 6.3%	1.00	0.97	18.4	15.2	1.07	1.03
4	3.7 - 4.8%	1.01	0.98	18.8	15.9	1.08	1.05
3	2.3 - 3.7%	1.00	0.96	23.3	16.8	1.11	1.04
2	0.8 - 2.2%	1.02	0.97	24.3	18.4	1.12	1.05
1	0.0 - 0.8%	1.06	0.96	27.8	18.4	1.15	1.05
Philadelphia	15.4%	1.01	0.99	20.6	14.8	1.09	1.04

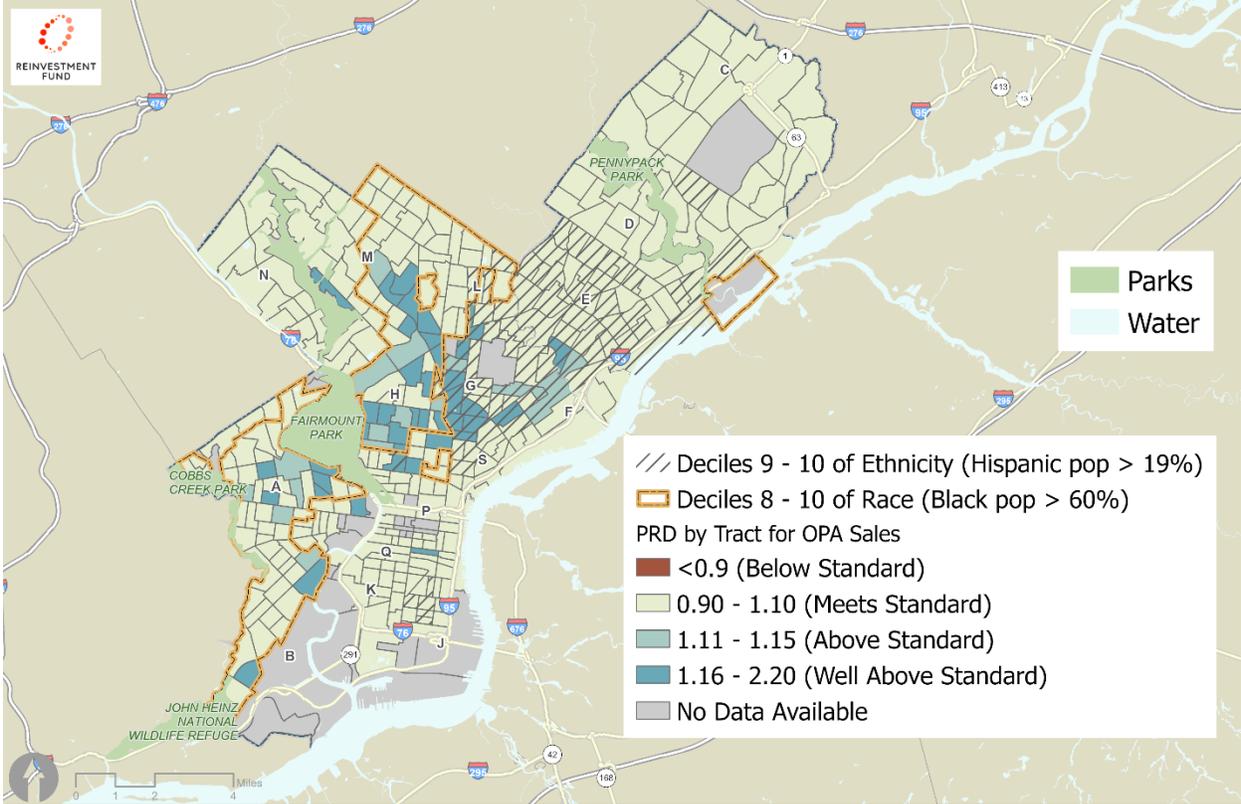
Table 3: Median Ratios, COD, and PRD by Census Tract Percentile Hispanic Residents Decile



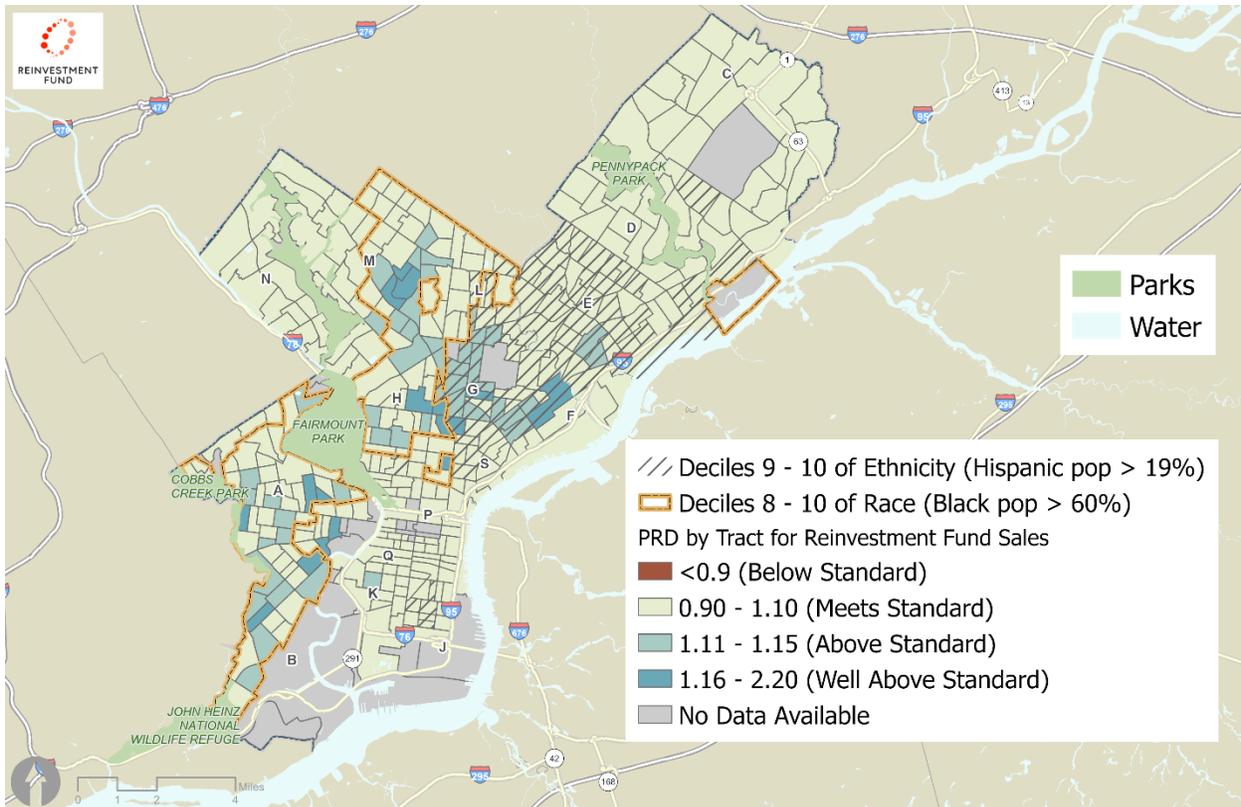
Map 8: COD for OPA Sales Denoting Areas of Racial / Ethnic Concentration



Map 9: COD for Reinvestment Fund Sales Denoting Areas of Racial / Ethnic Concentration



Map 10: PRD for OPA Sales Denoting Areas of Racial / Ethnic Concentration



Map 11: PRD for Reinvestment Fund Sales Denoting Areas of Racial / Ethnic Concentration

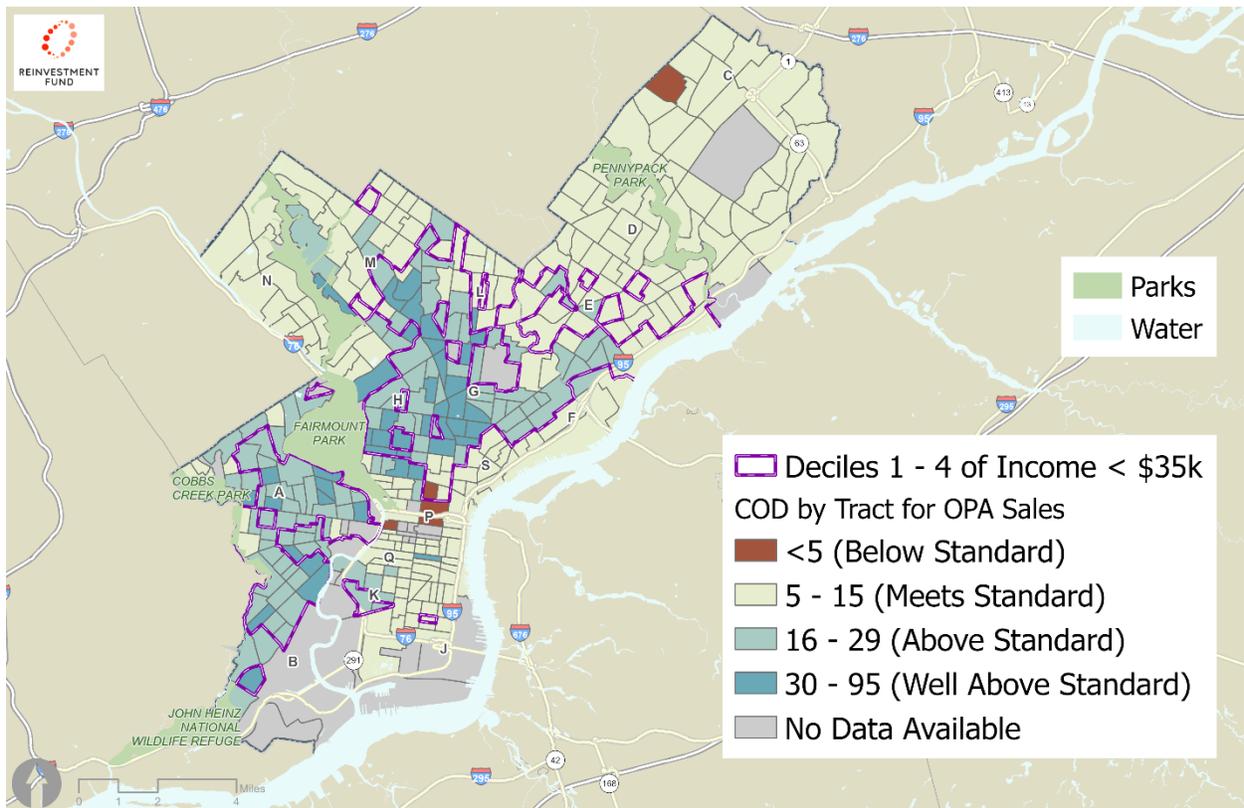
The Statistical Evidence of Systemic Neighborhood Income Bias

Finally, the data shows that assessment inaccuracies tend to be concentrated in lower-income neighborhoods. Table 4 shows that property owners living in areas with a median income above \$81,000 per year have assessments that are reasonably accurate and uniform by all measures. They can trust that their OPA assessments are accurate, uniform, and not regressive – in short that the assessments and the tax bills are fair. In contrast, however, property owners in an area with incomes that are less than \$58,000 have very high CODs and PRDs regardless of which dataset is used. Three of the lower income deciles also have high median assessment ratios according to Reinvestment Fund Sales.

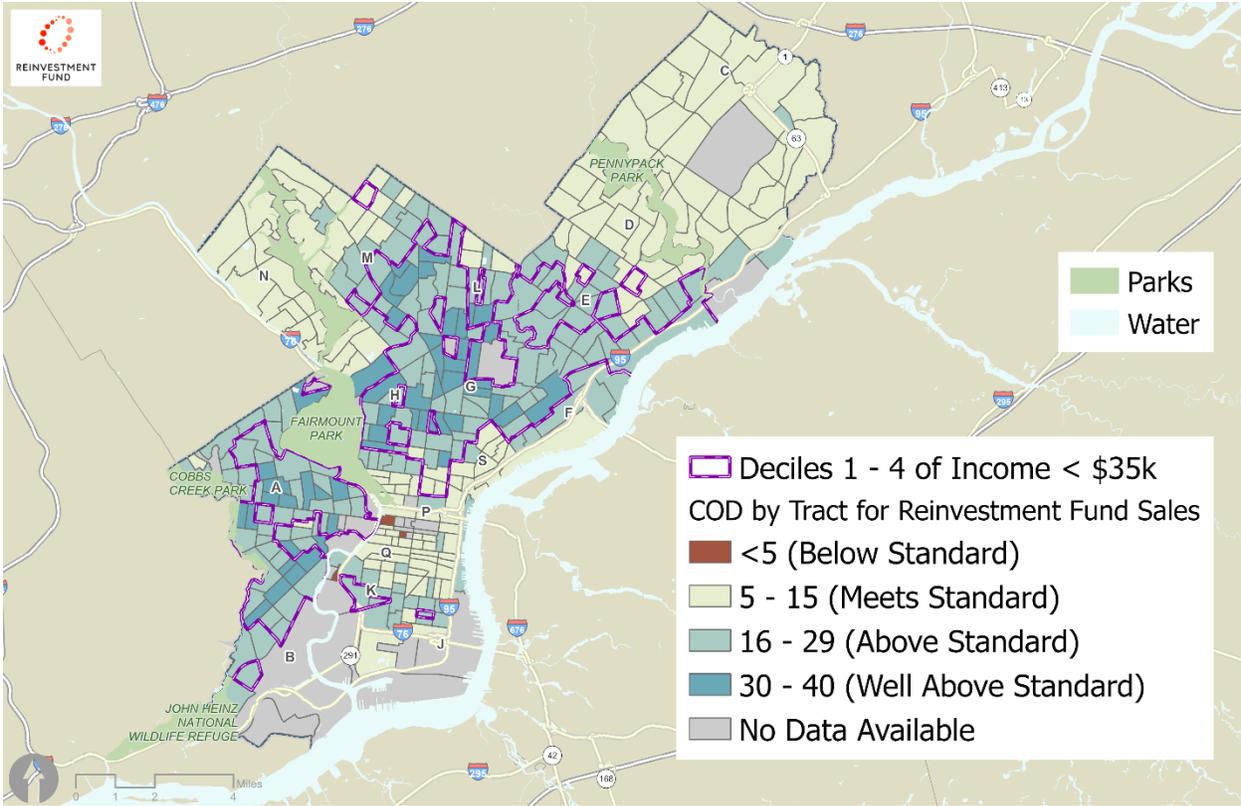
Taken together, Table 4 and Maps 12 through 15 show that low-income areas not only have higher assessment ratios, on average, than other areas (income-related bias), but also that these areas have more variation around the median and, within the areas themselves, there is considerable regressivity.

Census Tract Income		Median Ratio 0.9-1.1		Coef. of Dispersion < 15		Price-Related Differential 0.98-1.03	
Income Decile	Med. Income	RF Sales	OPA Sales	RF Sales	OPA Sales	RF Sales	OPA Sales
10	\$95,455-\$210,322	0.98	0.98	11.7	10.5	1.03	1.03
9	\$81,367-\$94,735	0.99	0.98	12.2	10.9	1.03	1.03
8	\$66,830-\$81,262	0.98	0.98	14.3	11.3	1.03	1.02
7	\$58,349-\$66,217	1.01	0.99	16.3	12.1	1.04	1.02
6	\$49,787-\$58,186	1.02	0.99	18.3	13.5	1.06	1.04
5	\$45,154-\$49,748	1.03	0.98	22.0	15.9	1.09	1.05
4	\$36,712-\$44,917	1.07	0.97	26.5	18.3	1.11	1.05
3	\$30,077-\$36,646	1.12	0.94	30.5	26.0	1.14	1.12
2	\$21,670-\$29,597	1.15	0.95	30.8	25.5	1.14	1.10
1	\$11,955-\$21,638	1.23	0.97	30.6	29.0	1.19	1.13
Philadelphia	\$52,649	1.01	0.99	20.6	14.8	1.09	1.04

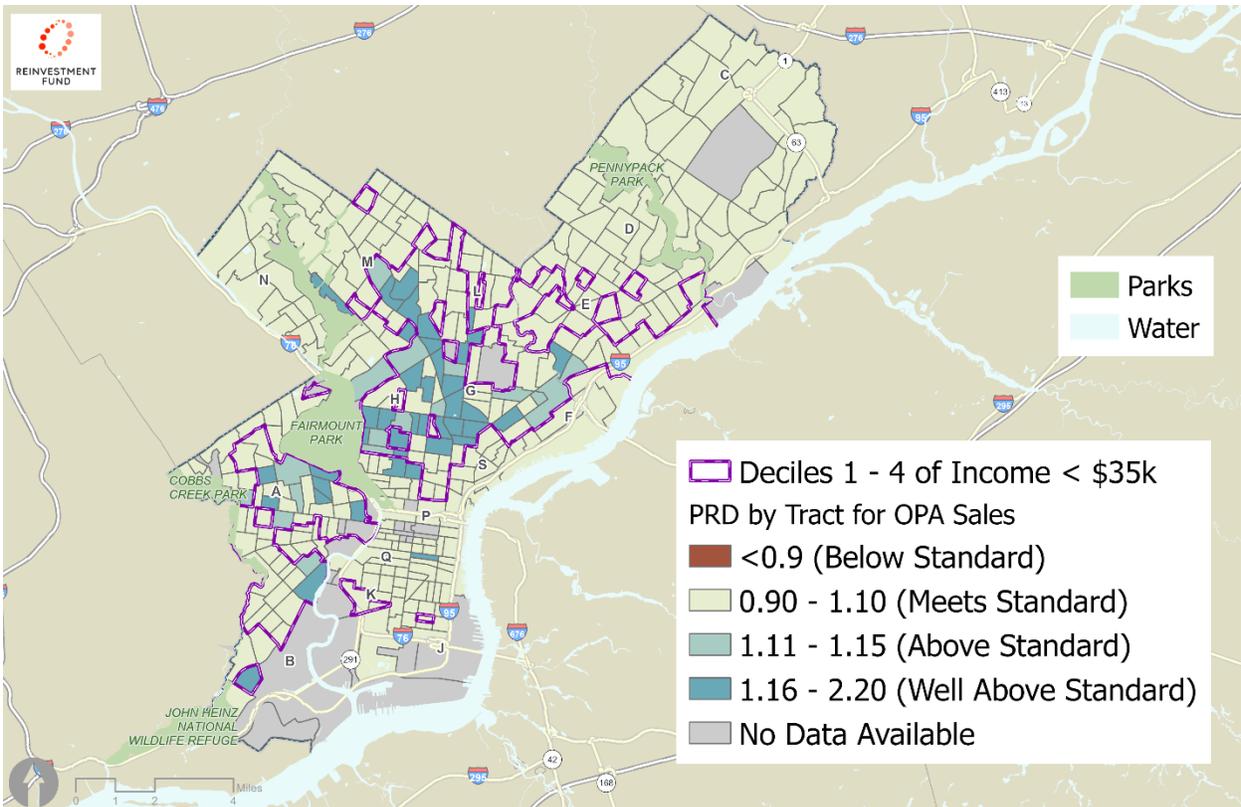
Table 4: Median Ratios, COD, and PRD by Census Tract Median Household Income decile



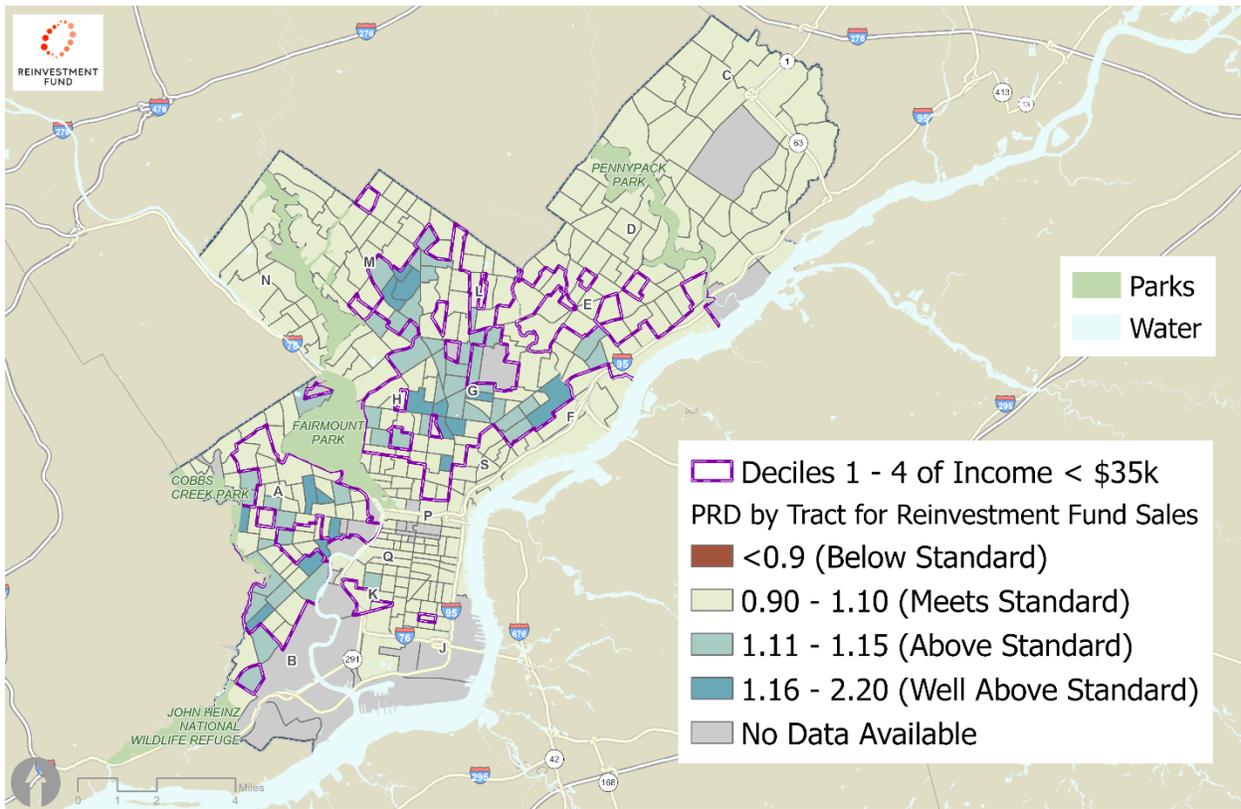
Map 12: COD for OPA Sales Denoting Low Income Areas



Map 13: COD for Reinvestment Fund Sales Denoting Low Income Areas



Map 14: PRD for OPA Sales Denoting Low Income Areas



Map 15: PRD for Reinvestment Fund Sales Denoting Low Income Areas

Potential Sources of Bias

Our detailed analysis clearly demonstrates two things:

- Citywide, the median assessment ratio for residential properties is close to where it should be, while variations around the median (COD) and bias related to price (PRD) are approaching IAAO standards.
- However, there are neighborhood “hotspots” where significant problems with assessment quality are concentrated. These “hotspots” more frequently have a higher percentage of Black, Hispanic, or lower income residents.

The natural next question is: “What are the *causes* of this systemic bias?” It is difficult to answer this from outside OPA, without a detailed understanding of all their policies and procedures. Nevertheless, we know that just as evaluation results depend on the data used, so also the original assessments depend on the data used. We discuss some of these issues in the following sections.

The Philadelphia Residential Abatement Program’s Effect on Assessment Accuracy

Philadelphia has residential property tax abatement programs⁴⁰ that provide ten years of tax relief on the improvement (that is, the residence) of a qualifying property that was newly constructed or substantially rehabilitated.

Our analysis finds that OPA has improperly included the sale of tax-abated properties in their sales file. Using the sales of abated properties in assessment models biases the assessment of non-abated properties upward. Purchasers of abated properties pay for both the value of the home and the value of the property taxes foregone by the abatement.⁴¹ The value of non-abated properties, even if otherwise similar, cannot be accurately inferred from the sale price of abated properties.

Including abated sales in assessment modeling is prohibited by law for these reasons. Of about 58,000 OPA sales, we observed active abatements in 1,323 cases (about 2.3% of sales) that were improperly included in the sales data.

Other Issues Related to Selecting/Rejecting the Appropriate Sales on Which to Base Assessments

Our analysis demonstrates the importance of understanding what data is included or excluded from the models estimating assessed values and evaluating their resulting quality. Whether it is a ratio study looking at accuracy in assessments or an equity study, adding racial, demographic and economic data, we see a difference between the results using OPA Sales or Reinvestment Fund Sales.

Determination of “the right” set of sales data that goes into both assessment modeling and evaluation of the assessment results is both art and science. The industry standard guide, “Standard on Verification and Adjustment of Sales,” states several rules of thumb for when sales are “generally considered” invalid,⁴² and we created our dataset with those rules.

But OPA employs an additional set of rules⁴³ to determine if a sale is invalid beyond the IAAO guidelines. These additional internal rules include considering: that the “original sales price was

⁴⁰ Philadelphia Code § 19-1303.2.

⁴¹ See e.g. Gillen, Kevin. “The Value of the Abatement,” *The Philadelphia Citizen*, August 16, 2018. Available at: <https://thephiladelphiacitizen.org/the-value-of-the-abatement/> (accessed 09/13/2023) (stating, “This higher-than-otherwise price results from the abatement conferring a significant tax advantage to the property (e.g. very low real estate taxes for 10 years) that increases its final market value.”)

⁴² In IAAO’s “Standard on Verification and Adjustment of Sales”, they state, “The following types of sales **are often** found to be invalid...” [emphasis added]. IAAO, *Standard on Verification and Adjustment of Sales*, 2020, Section 5.4, “Sales Generally Considered Invalid”, starting on page 13. Available at: https://www.iaao.org/media/standards/Verification_Adjustment_of_Sales.pdf (accessed 10/23/2023).

⁴³ See Keene note 21 *supra*.

not reflective of market value”,⁴⁴ not being on the market a sufficient amount of time or for too long, cash sales, and sales to or from a “predatory speculator”.⁴⁵ In addition to IAAO’s general guidelines and OPA’s extensive set of rules, IAAO further allows for sales to be removed if “[d]ata for the sale are incomplete, unverifiable, or suspect” or “[t]he sale fails to pass one or more specific tests of acceptability.”⁴⁶ The combined effect of these guidelines is likely over-exclusion of sales because the approach is designed to find reasons why a given sale is imperfect rather than whether a sale provides useful information about both the typical sale price and sales price variation.

- We found that the types of sales that are most likely to be rejected as suspect by OPA are more common in the areas where we observe assessment quality issues such as North and West Philadelphia.

For example, investor purchases (those by legal entities like Limited Liability Companies or Limited Partnerships) were very common in North and West Philadelphia during the period of real estate sales used for the 2023 assessments.⁴⁷ Those entities are often more sophisticated than the typical residential buyer, and better resourced, and therefore are more likely to pay less for comparable purchases. Excluding those sales would therefore result in higher assessments – but in many of these neighborhoods, those are the typical sales. Excluding those sales as “non-market” has the perverse effect of raising assessments on the same homeowners who have to negotiate with these entities and on people of similar economic means who are both competing with these entities for limited housing supply or renting from these entities when they convert single family homes into rentals.

In addition, there is a type of transaction called a “Sheriff” sale which includes sales by a bank or other institution following mortgage foreclosure. OPA seems to exclude all Sheriff sales from consideration without analysis, even though such sales may contain important market information.

Sheriff sales typically occur through auctions in which would-be buyers bid against each other, and sellers have at least some incentive to obtain a high price. Moreover, Sheriff sales are geographically concentrated. In those neighborhoods, they may provide at least as much information about actual market values as the relatively smaller number of transactions that occur between owner-occupants.

⁴⁴ That is, that an OPA staff person reviewing a sale decides that the price is too low or too high *absent other indications of a non-market transaction*. This is a procedure with a very high potential for subjective decision making and therefore bias. OPA should, at a minimum, make public any guidelines around determination of non-market sale price, such as: what thresholds are used, how those are determined, are there additional levels of review, etc.

⁴⁵ There is also a later step in the process where a sale can be removed from modeling or OPA staff can “manually adjust [the] value ... that is not reasonable” because the sale is considered an outlier. Manual adjustments have a high potential for introducing the adjusters’ bias into the modeling process.

⁴⁶ See IAAO, *Standard on Verification and Adjustment of Sales*, *supra* note 39 on page 52.

⁴⁷ See Dowdall, Emily et. al. *Investor Home Purchases and the Rising Threat to Owners and Renters: Tales from 3 Cities*. Available at: https://www.reinvestment.com/wp-content/uploads/2022/09/220923_InvestorHomePurchases_Final.pdf.

Summarily excluding Sheriff sales, especially in neighborhoods where they are a relatively high proportion of transactions, can lead to systematic assessment inaccuracies. Such sales tend to occur near the lower end of the local price range. If they are improperly excluded, a disproportionate fraction of the remaining sales will be at the high end, and these will dominate the determination of assessments. Lower value properties will be over assessed. If the improperly excluded transactions are in neighborhoods with a particular income or ethnic group, that group will suffer from the results of the data-editing process.

A subtle and unintentional source of bias toward excluding low value sales from the assessment dataset can arise from the fact that OPA supervisors and professional staff tend to be full-time employed people. When these professionals review price data coming into the office from very low-value neighborhoods, they might find the prices so far outside their personal experience that they unconsciously question the data's validity. As a result, they are potentially predisposed to find more reasons to exclude low sale prices from the assessment database than higher prices. When this happens, assessments will be based only on higher-price sales. Low-price property, lacking representation in the original dataset, will be over assessed.

Alternately, even if all valid low prices are initially included in the master dataset and the computerized process leads to a correctly low draft assessment for low-value properties, in-office review might lead to an upward adjustment prior to issuing final assessments because reviewers consider the draft assessment a mistake. Based on their personal knowledge and experience, it may seem subjectively impossible that any occupiable property could have such a low value. Even for an experienced assessor it may seem (and be) a reasonable use of his or her discretion to exclude this low valuation, unintentionally inflating valuations in the area being assessed. Discretion and judgment are part of both the art and the science of assessment, and they cannot be eliminated.

In short, the selection of which sales to use in modeling or evaluation of assessment quality are a mixture of objective factors and subjective determinations, and those subjective determinations may not be made consistently by different sets of analysts with the same data and training. These are judgment calls. They may be unavoidable, but they should not be made in a way that biases the assessment process against any group or neighborhood.

Bias of this type is neither more nor less than a specific example of the limitations everyone faces. The challenge for OPA - and all assessment officials in all jurisdictions - is to expand their experience and properly account for all relevant information, especially since what may appear to them as innocuous decisions actually affect peoples' taxes.

In order to expand their experience by inviting input from property owners, some assessors make their determination of sale validity public,⁴⁸ including the reason(s) why a sale is deemed

⁴⁸ Florida Appraisers (which is their term for Assessors) release datasets of each evaluated sale, whether the sale is determined as qualified or not, and why. For example, here is Duval County (Jacksonville):

invalid. This should be the minimum standard in Philadelphia to make sure that these important data determinations are made in a way that does not bias assessments before they are even modeled. In addition, OPA should regularly have an independent auditor review the sales validation process and results for bias.

This section has discussed factors related to choosing the correct data on which to base assessments. There are also many other factors that contribute to making good assessments. Some of these are discussed in Appendix I.

<https://www.jacksonville.gov/departments/property-appraiser/information-offerings>. Accessed 8/17/2023. In Pennsylvania, Allegheny County frequently releases property sales transactions and the Assessors "Sales Validation Codes Dictionary" detailing whether each sale is considered "a valid representation of the true market value of the property". Western Pennsylvania Data Portal, "Allegheny County Property Sale Transactions." (Available at: <https://data.wprdc.org/dataset/real-estate-sales>). Accessed 10/23/2023.

Conclusion & Recommendations

OPA has made significant progress in citywide assessment quality as shown by our analysis of the citywide median ratio, COD, and PRD. OPA has also made progress in making their assessment methodology more transparent both since the Actual Value Initiative (AVI)⁴⁹ in 2013 and from the 2019 assessments to the most recent, 2023 assessments. Most notably the median ratio for properties across the city has improved from general under assessment to close to a one-to-one valuation, and in many areas of the city the variation around the median ratio is within IAAO guidelines. Examined at a more granular level, however, issues of assessment accuracy, uniformity, and regressivity remain. Property assessment requires, at least in part, some averaging of characteristics and therefore disadvantaging of some property owners relative to others. But there are generally accepted ranges of assessment accuracy, for example, generally accepted variability in the COD, and this analysis finds OPA's assessments frequently outside of those ranges. Most concerning, though, in the Philadelphia case is that places with higher levels of assessment quality issues are those where Black, Hispanic, and lower income Philadelphians live.

Summary of Findings

- The median assessment ratio for residential properties in Philadelphia is close to where it should be, regardless of which dataset is used.
- The average variation in assessments around the citywide median ratio exceeds IAAO standards when evaluated with Reinvestment Fund Sales and just barely meets the standard using OPA Sales.
- For the city as a whole, regardless of which dataset is used, low value residential properties are over assessed relative to higher value properties at a rate that exceeds IAAO standards.
- Some OPA Zones also show non-uniformity and regressivity in assessments that are outside of IAAO standards.
- The OPA Zones that show unacceptably high levels of non-uniformity and regressivity are those with the largest shares of Black residents, Hispanic residents, and low-income residents.
- Neighborhoods that contain the largest shares of residents who are Black, Hispanic, and/or low-income are more likely to be inaccurately assessed, over assessed, and suffer from under assessment of high value properties relative to lower value properties.

OPA's assessment process and the assessments themselves still disadvantage Philadelphians based on the economic and racial composition of neighborhoods and the value of homes.

The fact that the quality of OPA assessments varies across Philadelphia is well documented (see reports from the Office of the Controller of the City of Philadelphia and the Philadelphia

⁴⁹ The Actual Value Initiative was a reassessment of all real estate within the city of Philadelphia and was intended to change, "the certified market value of every piece of property in the city, the way individual assessments are used to calculate tax bills, and how property owners deal with any big tax increases that might result from the new system." See Pew, [The Actual Value Initiative: Overhauling Property Taxes in Philadelphia](https://www.pewtrusts.org/en/research-and-analysis/reports/2012/11/28/the-actual-value-initiative-overhauling-property-taxes-in-philadelphia). November 28, 2012, (available at: <https://www.pewtrusts.org/en/research-and-analysis/reports/2012/11/28/the-actual-value-initiative-overhauling-property-taxes-in-philadelphia>). Accessed 11/13/2023.

Inquirer⁵⁰). While we are unable to articulate with certainty the procedural issues with OPA's property assessments causing the observed systemic problems, we have discussed, both earlier in this report and in the appendixes, some of the many places in the assessment process where even facially unbiased decisions are made that could in turn bias the resulting assessments. These include the sales validation process (i.e., differential inclusion/exclusion of sales for modeling and evaluation purposes), the choice of the statistical model employed in assessing (i.e., statistical regression models that employ conditional averaging), and post-modeling adjustments.

We also find that after recreating the sales validation process, OPA is excluding many more sales than we do in the areas where we see assessment quality issues. Excluding sales inappropriately can both bias the statistical modeling of assessed values and hide the degree to which an assessment quality issue exists. Because we can only recreate sales validation exclusions based on publicly noted factors like a Sheriff Sale, within-family sale, or sale involving the City, we can only conclude that OPA is excluding sales for reasons like market noise or that a purchaser is a predatory speculator⁵¹, which are determinations that are both: (1) judgement calls that could bias the resulting assessments, and (2) that should at least be independently verified to confirm that those exclusions are not biasing the final assessments.

Care should be taken after each of these decisions to ensure that systemic bias has not unintentionally entered the process. The law has long recognized that a facially unbiased process can nevertheless have a disparate impact on minority group members. To that end it suffices to show that unacceptably high variation in assessment quality ("non-uniformity") remains in some areas of Philadelphia, and that those assessment quality issues overlap with race, ethnicity, and income. The minimum bar that assessors should clear is that any variation that results from their process should not be borne disparately by any racial or ethnic group, nor be economically biased in relation to either the price of individual properties or the income level of community residents. **Therefore, even when the processes used to produce assessments are facially unbiased, the resulting assessments should be frequently evaluated to ensure no resulting systemic bias.**

Our analysis shows that the cost of these accuracy and equity issues falls inequitably on the residents of low-income, Black and Hispanic communities. Low-income Philadelphians already face many challenges in getting and keeping quality, affordable housing; paying an inequitably high tax bill need not exacerbate that problem. The lack of uniformity and observed pattern of regressivity in the assessments means that there is a relatively higher tax burden for lower or moderate-income homeowners. That tax burden can stress already tight family budgets causing undue financial burden and in the long run, impact the creation of wealth in one's home and the ability to build wealth through savings,⁵² which can have multi-generational impacts. Aside

⁵⁰ See <https://controller.phila.gov/philadelphia-audits/opa-accuracy-2023/> for the Controller's report, accessed 1/21/2021; and <https://www.inquirer.com/news/philadelphia/philadelphia-property-tax-assessment-fairness-equity-20220803.html> for the *Inquirer*.

⁵¹ See Keene note 17 *supra*.

⁵² See Rothstein, Richard. *The Color of Law: A Forgotten History of How Our Government Segregated America*. 2017 (stating, "African Americans could save less from their wages because in some (perhaps many) cities, discriminatory property assessments left them with less disposable income than whites with similar earnings.")

from considerations of equity and compliance with relevant laws and regulations, it is important to note that even small over assessments are meaningful to the many Philadelphia households for whom even a few hundred dollars unnecessarily spent can be destabilizing and ultimately lead to delinquency and foreclosure – not to mention that a few hundred dollars year after year represents a significant amount of potential wealth not accumulated.

Recommendations

Based on our analysis, the City of Philadelphia should:

- 1) Retain an independent third-party to conduct a racial equity study annually to examine potential systemic bias in OPA assessments and recommend appropriate reforms. The study should monitor OPA’s assessment processes for any inappropriate connection to the racial, ethnic, or economic composition of the neighborhood where each property is located. OPA should provide the third-party access to all procedures, methodologies, and datasets that OPA used to determine each property’s assessed value.
- 2) Increase transparency by publicly releasing all datasets used in creating property assessments, including the set of sales that were excluded and the reasons why, the set of sales and any features used in modeling, and the modeling code and/or output on OpenDataPhilly or a similar platform. This has become standard process in some jurisdictions,⁵³ and Philadelphia should follow suit.
- 3) Create a plan for evaluating each step of the assessment process for systemic bias after the initial valuation is completed without taking race, ethnicity, or income into account. Review each step for potential biases after completion. Publicly release the results of these reviews so progress can be tracked over time. While the initial valuation process cannot and should not consider race as a factor, OPA should set up a system to check for unintentional errors or bias, particularly in “hotspot” Black and Hispanic neighborhoods.
- 4) Make the methodology and results for creating property condition grades public, including data used for grading each individual property. Ensure the methodology was applied consistently by all OPA staff and review annually for deviation from guidelines and how those deviations relate to bias in assessments.
- 5) Ensure no sales of properties with tax abatements are included in creating assessments.

⁵³ For example, Cook County’s (Chicago) entire codebase and data are available at: https://gitlab.com/ccao-data-science---modeling/models/ccao_res_avm%23data-used, accessed 8/17/2023. Florida Appraisers (which is their term for Assessors) release datasets of each evaluated sale, whether the sale is determined as qualified or not, and why. For example here is Duval County (Jacksonville): https://www.coj.net/departments/property-appraiser/information-offerings#Collapse_Expand7, accessed 8/17/2023.

- 6) Convene a stakeholder group including representatives from OPA, City Administration, City Council, real estate professionals, legal services organizations, and other interested parties to meet at least twice each year to review progress toward implementing the above recommendations and to address other issues and concerns.

Appendix I: Some Pathways to Consistently Better Assessments

The main body of this report demonstrates in great detail that, while in some areas OPA’s assessments are sufficiently uniform and within IAAO standards, there are “hotspots” where assessments are non-uniform and not within the IAAO standards. These non-uniform, non-IAAO compliant “hotspots” tend to be concentrated in Black and Hispanic low-income neighborhoods (e.g., North Philadelphia, Southwest Philadelphia). The lack of uniformity remains true whether using Reinvestment Fund Sales data or OPA Sales data. While the degree of non-uniformity is less using OPA Sales data, the evidence of non-uniform “hotspots” remains.

Here we suggest some pathways to overcome and correct this systemic bias.

The Challenge

With about 580,000 individual properties to assess, there is no reasonable way OPA can perform individual inspections and appraisals of every property in Philadelphia. This is why OPA – like many municipalities – relies on a system of mass assessments, rather than appraisals. It is also why “rough uniformity” in mass assessments is accepted by the Pennsylvania courts.⁵⁴

Part of the roughness occurs because the identical property can sell for different prices in different parts of the city. To minimize this roughness, one of the most important parts of mass assessment is to identify the boundaries of distinct market areas within which the price for similar properties does not vary; the price is nearly the same for all similar properties in the area. OPA has established such areas in the city of Philadelphia and calls each of them a geographic market area (GMA).

Within each GMA mass assessment relies on averages. The reported sale prices for recently sold properties of a particular type in a particular GMA are collected and averaged, and the resulting average is applied to all properties of that type in that GMA.⁵⁵

Even within correctly drawn GMAs, there is some (small) variation in prices. A property that sells for a price *below* the average, whether because of some unobserved defect or any other reason, will be over assessed, while a property with a price *above* the average will be under assessed. A certain amount of regressivity is therefore unavoidable within any particular small area being assessed; this is why the IAAO has a tolerance range for the PRD measure. However, with good assessment methods and if GMA boundaries are correctly drawn, (a) the regressivity within each GMA will be small, and (b) when GMAs are aggregated into assessment zones,

⁵⁴GM Berkshire Hills LLC v. Berks Cnty. Bd. of Assessment, 290 A.3d 238, 250 (Pa. 2023).

⁵⁵This is an idealized assessment process, in which each GMA is assessed independently. In fact, OPA combines many GMAs and assesses them as a group.

Census tracts, or any other larger geography, the localized regressivities will cancel each other out and become statistically undetectable or nearly so.⁵⁶

Nevertheless, regressivity is a problem when it is large within a single GMA or found in a grouping of many GMAs.

Defining and Embracing the Goal

OPA staff produce fair and uniform assessments when they achieve three goals:

- Minimize the number of inaccuracies.
- Keep the inaccuracies as small as possible.
- Ensure that all individual properties and neighborhoods are treated equally with respect to unavoidable inaccuracies. In statistical language, this means ensuring that whatever inaccuracies observed, they should be randomly distributed; no group⁵⁷ should be more likely than any other group to be over or under assessed.

The statistical and other scientific methods to approach these goals exist and are well-known in the assessment community.⁵⁸ The larger question is whether the residential and business property owners in Philadelphia and their elected officials *want* to achieve the goal of fair and accurate assessments. In this context, the words of Albert Einstein come to mind:⁵⁹

“What hopes and fears does the scientific method imply for mankind? I do not think that this is the right way to put the question. Whatever this tool in the hand of man will produce depends entirely on the nature of the goals alive in this mankind. Once these goals exist, the scientific method furnishes means to realize them. Yet it cannot furnish the very goals. ...

Perfection of means and confusion of goals seem — in my opinion — to characterize our age. If we desire sincerely and passionately the safety, the welfare, and the free development of the talents of all men, we shall not be in want of the means to approach such a state.”

Nor, if we sincerely desire a strong and equitable property tax system, shall we lack the means to achieve such a system. Trained professionals in OPA have access to research methodologies that can produce fair and uniform assessments – if the social and political environments clearly

⁵⁶The inaccuracies cancel because GMAs have different average prices. Assume accurate assessing and imagine one GMA with an average price and assessment of \$100,000; a home that sells there for \$105,000 will be under assessed. In another GMA where the average price and assessment are \$110,000, a home that sells for \$105,000 will be over assessed. When these two and many other GMAs are combined, the inaccuracies offset each other.

⁵⁷“Group” is defined broadly here to mean any identifiable set of properties however classed: by value, physical type (one-story, two-story, etc.), neighborhood, characteristics of the owner (income, ethnicity, etc.), form of ownership (outright, or fee simple, some form of trust, etc.), and so on. All should have the same (high) probability of being correctly assessed and when they are incorrectly assessed, all should have the same probability of being over or under assessed by the same (low) percentage.

⁵⁸For readers who wish to pursue these methods, one place to begin is the IAAO Internet resources page, https://www.iaao.org/wcm/Resources/wcm/Resources_Content/Resources.aspx. Accessed 11/1/2023.

⁵⁹Albert Einstein, “The Common Language of Science,” transcript of a radio broadcast for London’s *Science Conference* on October 2, 1941, in Einstein’s anthology *Ideas and Opinions*, as quoted on <http://www.brainpickings.org/2015/04/27/albert-einstein-the-common-language-of-science>, accessed 1/11/2016.

set a goal for them that they should achieve fair assessments, namely, that all assessments for all property owners, regardless of socioeconomic and political status, consistently be as close to actual market value as is humanly possible.

A well-designed social awareness campaign aimed at changing the narrative about property taxes can promote community buy-in to the goal of uniformly fair assessments. We believe most people do not understand how the assessment system makes the fairness of each individual's tax dependent on everyone else's assessment. Nor, in many cases, do people realize how important the property tax is for enabling the city to do everything that we collectively want and need (educating our children, policing our streets, picking up trash and plowing snow, repaving neighborhood streets, etc.). Education about this and other communitarian aspects of the property tax can arouse people's innate sense of fairness, encourage respectful conversations between the owners of high- and low-value property, and move the political environment closer to long-run support for an assessment system fair to everyone.

Contemporary statistical methods are extremely effective at finding relationships within any given set of data. For example, OPA has a dataset with, on the one hand, sale prices for recently sold properties and, on the other hand, matching property characteristics (number of square feet in the building, number of bathrooms, whether there is a basement or attic, etc.). Given this dataset, computer models that employ machine learning⁶⁰ and other forms of artificial intelligence can create one or more equations that begin with the characteristics and quite accurately estimate the prices.

The temptation is, without further analysis, to use these computer-generated equations on the characteristics of unsold properties, in order to estimate what prices would be if these properties had sold and then to base assessments on these estimated prices. However, using the equations in this way will work only under the very unlikely condition that the original dataset completely and accurately represents all properties in the market area being assessed. Without this perfect symmetry, inaccurate assessments will almost certainly result. For example, it might be that a disproportionate number of smaller homes were sold compared to larger ones in the market area, or that more homes located on the east side were sold than on the west side and there is a price differential between east and west, or that only one or two homes with a slate roof were sold but there are many such homes in the market area, or _____ [fill in the blank with any other possible mismatch between the dataset of sold properties and the collection of all properties to be assessed in the real-world market area].

Generally speaking, the more types of mismatch there are between the dataset of sold properties and the real-world set of all properties, the more and the larger will be the errors in predicted prices. Statisticians with knowledge of these pitfalls can take steps to reduce some of

⁶⁰Machine learning is a form of artificial intelligence in which the computer is given a problem to solve, data to work with, and instructions to manipulate the data until the computer find the best possible solution.

the errors during the equation-building process, but any real solution must also include careful review of the predicted prices in order to ensure that they are consistent with actual conditions in the market area.

The following sections discuss several types of possible mismatch, explain how mismatches can produce specific kinds of assessment bias, and offer suggestions for avoiding bias.

Geographies

An early step in the assessment process is defining geographic market areas (GMAs). GMAs are needed because in order to make assessments, sale prices of recently sold properties are compared with the physical characteristics of those properties, and that relationship is then projected to all properties in the area being assessed. However, the relationship between characteristics and price varies from one part of the city to the next. If a high-price neighborhood is included in the same GMA as a low-price neighborhood, assessments will tend toward the average and regressivity will result. For this reason, OPA must establish GMAs within which the relationship between characteristics and price varies as little as possible or not at all.

Often the difference of only a few blocks will alter the price for which an otherwise identical house can sell. For this reason, GMA boundaries must be carefully crafted and GMAs themselves may be quite small. Because GMAs are intended to capture the actual, de facto reality of real estate submarkets within the city, there is no reason to believe that GMA boundaries will or should coincide with boundaries established for other purposes, such as the naming of historical community areas, U.S. Census tracts, postal ZIP codes, and the like.

In order to prevent assessment bias, the boundaries of GMAs should be reviewed at each reassessment to ensure that they keep pace with changing market conditions.

Property Characteristics and Sample Size

Another important contributor to assessment accuracy is properly accounting for distinctions among different types of property, such as number of rooms and stories in the building, since these might cause properties to sell for different amounts of money even within a properly defined GMA.

Challenges in this regard are numerous. By the nature of statistical analyses (for mathematical reasons not explained in this report), the more individual characteristics OPA plans to evaluate for each piece of property, the more sales there must be during the time period under investigation for the analysis to be sound.

For example, if data are collected for only a single variable, say, the number of square feet in each property, then only a relatively small number of sales are needed for the statistical techniques to produce results, and GMAs can be quite small. But assessments based on only

one variable will be inaccurate because property values depend on many factors other than simply the building's square footage: layout and size of individual rooms, number of full and half baths, size and shape of the lot, whether the lot is on the corner or in the middle of a block, quality of the building's maintenance, whether nearby land uses (how near is "near"?) raise or lower value, proximity to public transit or highways, presence or absence and the size of any garage, etc., etc. Each variable added to the analysis potentially increases accuracy, but only if enough additional sales can also be added to the database.

For more sales to be added to the database, either the size of the GMA, the number of years in the lookback period, or both must be increased. But when these are increased, the representativeness of the sales decreases with respect to current market conditions in different parts of the GMA. Constant vigilance and adaptation of procedures are needed in order to obtain the maximum amount of useful information from the data available in the face of annual changes in the number, type, and location of sales throughout the city.

Representativeness of Data

Suppose an area consists of row and detached houses, but only row houses sell during the lookback period. There will be no reliable data for assigning value to the detached houses. If detached houses, when they do sell, would typically sell for more than a row house with the same physical characteristics, then assessments for the detached houses will be too low because based on the only available data, namely, for row houses.

Overcoming lack of sales data is often a time-consuming process as staff search for other, atypical sources of information about value and try to develop neighborhood-specific and ad-hoc methodologies to fill the gaps. These might include interviews with real estate brokers in the target GMA and careful review of other GMAs, including possible site visits, in an effort to discover data that can reasonably be adapted from other GMAs to this one.

Accuracy of Department of Records Sales Data

Up to this point, we have assumed that sales data collected by OPA from the Department of Records (DOR) accurately reflect the price paid for each parcel of real estate. If this assumption does not hold, and it very well may not, both random and systematic assessment inaccuracies can result.

Consider, for example, "personal" property (or "personalty"), which is not taxable as real estate. One house may sell completely empty; its reported price correctly reflects the real estate alone. Another house may sell with a large amount of personalty included, such as major appliances, expensive furniture, power tools for the yard, and so forth.

Whenever the value of personalty is lumped into the total price reported on property transfer documents, over assessment will result not only for this individual property but also for all similar properties with which this one is averaged. This presumably occurs more often in the

case of less knowledgeable buyers and buyers with less access to well-trained advisors for help in filling out DOR forms. If these buyers tend more often to be in a particular income or ethnic group, OPA's reliance on incorrectly filled out DOR forms will have a negative disparate impact on the assessments for members of that group.

On the other hand, market participants with knowledge of the system, especially if advised in certain ways, may not only (properly) exclude personalty from the transfer forms but also (improperly) overestimate its value, sometimes significantly. These and similar properties will be under assessed. If such properties tend more often to be exchanged among people in a particular income or ethnic group, assessments will be biased in favor of that group.

DOR transfer forms are also subject to error for other reasons not directly related to assessing. Prices may be misreported because amounts listed on the forms become the basis for levying real estate transfer taxes. In addition, the forms are public records and this may lead some people to try and conceal the true price paid or received.

These and other problems with DOR records are beyond OPA's direct control but can lead to inaccurate assessments. One solution is for OPA, as part of the data editing process, to identify properties with similar characteristics in OPA records that have substantially different DOR prices and investigate why.

Accuracy of OPA Data

Identifying properties with similar characteristics but substantially different DOR sale prices is only one of many data-editing techniques. Another important technique is the converse: examining properties with similar DOR sale prices but different OPA property characteristics. Both techniques, perhaps especially the second, can help identify errors in OPA's file of property characteristics which, if not corrected, will lead to inaccurate assessments.

Typical sources of erroneous property characteristics are factors like property improvements made without a correct permit as well as improvements for which a permit may not be required but which nevertheless add to a property's value. Errors of this type lead to regressive assessments. Suppose two properties are described in OPA's records as having the same characteristics, but one actually has unrecorded value-enhancing improvements. The improved property will sell for more than the unimproved one but both prices will be used in the statistical averaging process for assigning assessed value to all properties described in OPA's records as unimproved. Since some of the properties described as unimproved are actually improved, the correctly described (unimproved, lower value) properties will be over assessed, while incorrectly described (improved, higher value) properties will be under assessed.

The reverse can occur when changes are made to a property that decrease value but are not reported to OPA.

Routinely scanning DOR sales records and comparing them with OPA's property characteristics can help uncover errors in OPA file and prevent assessment inaccuracies from this cause.

Changing Market Conditions

In areas where values are changing rapidly, assessing is challenging not only as a practical matter but also theoretically.

Consider what are commonly called gentrifying neighborhoods: areas where prices are increasing rapidly, sometimes even doubling or tripling in just a few years. One argument is that the observed high prices, since they are being freely paid by actual purchasers, represent the true value of all real estate in the neighborhood. Therefore, the argument goes, persons who do not sell nevertheless have unrealized capital gains on which they should properly be assessed and taxed. The theory is that owners who do not now sell will recover the tax difference when they sell at some future time.

But do the observed prices really represent the value of all property in the neighborhood at that time? If everyone were to try and capture their apparently increased value by selling simultaneously, the supply of houses for sale would overwhelm the market and prices would collapse.

From this perspective, the high prices received by some are not indicators of a stable and mature market, but are anomalies made possible only by the unwillingness of others to sell at the same time. It seems reasonable that the new buyers can properly be taxed on the prices they pay, since they freely and knowingly enter into those transactions and actually pay those prices. They themselves set the value of the real estate they purchase and should rightfully expect to be assessed and pay taxes based on that value.

But those prices may not be applicable to properties purchased in the more distant past, since current market conditions in the neighborhood are known to be exceptionally volatile and those owners who are not selling could not, in fact, all obtain the observed high prices if they were to try and sell at the same time. Nor can anyone guarantee that the higher prices will hold at whatever future date the current non-sellers might become sellers.

This is a thorny issue related to the question of whether dwelling units are primarily places to live or primarily investments. If they are primarily investments, then everyone should be assessed on the currently observed investment prices being paid for the indicated commodity (in this case, houses). But if houses are primarily places to live, the value of a person's living space does not appreciably change just because the new neighbor next door places a higher value on *their* living space.

Full discussion of whether houses are primarily places to live or investments is well beyond the scope of this report and we do not presently see any social consensus on the matter. Yet resolution of the question is important because people's annual taxes depend on it.

Solutions to this challenge lie in the policy arena, outside the assessor's office. OPA's task is to assign accurate market values to all real estate, while the questions in rapidly changing market areas relate to the very definition of market value and to the separate, but related, question of whether, as a policy matter, property owners should or should not be protected from large year-to-year changes in assessments and taxes.

From the perspective of policymakers, one possible solution is some form of "acquisition-based assessing" (ABA) in which recently sold properties are reassessed to their purchase price while other, unsold properties are not reassessed or are reassessed using some other method.⁶¹ Over a period of years, this leads to a hodgepodge of assessments for similar-looking properties in close proximity to each other, but ABA is fair as long as it is publicized and consistently applied. Under ABA, buyers, knowing exactly what their assessment will be, can easily capitalize future taxes into their offer price, much as they now capitalize mortgage interest rates and other costs of ownership.

Another solution to dislocations potentially caused by rapidly changing prices is to place a maximum limit on the percent by which either assessments or the tax bill can change from one year to the next, whether up or down. Changes caused by modifications to the physical property are excepted, and the annual limit might be adjusted for inflation and changes in the tax levy.

ABA and change limits can be combined in various ways; but again, these are policy matters that only legislators can decide. The issue deserves considerable thought because gentrification most often occurs in lower and moderate-income neighborhoods, where unpredictable and rapidly increasing taxes can pose a special problem.

Information from Different Types of Sales

DOR records include properly vetted transactions between strangers in which a genuine arm's length price is paid, as well as transactions between parts of the same corporation in which the reported price bears little or no relationship to the real estate's value, and virtually every other type of transaction in between. Properly reviewing and coding these data is an essential prerequisite to accurate assessments.

Two principles should guide this review:

1. Include *only* those sales that provide reliable information about market values.

⁶¹The formally adopted, officially structured policy of ABA is decidedly different from the informal, unannounced assessment practice of "sale chasing" (SC). In SC, the assessor, without legal authorization, assesses recently sold properties to a level at or near their sale price while assessing other properties using different methods that generally lead to lower and less accurate assessments. Evaluations of assessors who chase sales will produce stellar performance statistics unless the evaluators employ other means beyond comparing assessments to sales occurring before the assessment date.

ABA, on the other hand, is a legislatively adopted policy for the purpose of making assessments and taxes predictable over the long run. Because it includes formal published regulations, market participants can confidently adjust their behavior for ABA, whereas the informal SC becomes a guessing game; for SC to be effective, assessors must deny they do it.

2. Include *all* sales that provide reliable information about market values.

The first principle seems self-evident. The second may seem less so, but it is equally important because each additional data point increases the representativeness of the final database and also because the statistical procedures used in assessing tend to produce more reliable results when they begin from a larger database (assuming the additional data are accurate). Ignoring or de-emphasizing the second principle, perhaps as an easy way to achieve the first principle, can lead to systematic assessment inaccuracies.

For example, there is a type of transaction called a “Sheriff” sale which includes sales by a bank or other institution following mortgage foreclosure. OPA seems to exclude all Sheriff sales from consideration without analysis, even though such sales may contain important market information.

Sheriff sales typically occur through auctions in which would-be buyers bid against each other, and sellers have at least some incentive to obtain a high price. Moreover, as demonstrated elsewhere in this report, Sheriff sales are geographically concentrated. In such neighborhoods, they may provide at least as much information about actual market values as the relatively smaller number of transactions that occur between owner-occupants.

Summarily excluding Sheriff sales, especially in neighborhoods where they are a relatively high proportion of transactions, can lead to systematic assessment inaccuracies. Such sales tend to occur near the lower end of the local price range. If they are improperly excluded, a disproportionate fraction of the remaining sales will be at the high end, and these will dominate the determination of assessments. Lower value properties will be over assessed. If it should happen that the improperly excluded transactions are in neighborhoods with a particular income or ethnic group, that group will suffer from a disparate impact of the data-editing process.

Similar concerns exist for some of the other types of sale in DOR’s file that are routinely excluded by OPA, such as transactions in which one or both parties is identified as an “investor,” corporation, or trust. Certainly, some of these sales ought to be excluded from the assessment master file. But just as certainly, some investors, corporations, and trusts pay actual market value when purchasing real estate. Spending the time and talent to review these and other sales for possible inclusion of some of them in the master file, although labor-intensive, can pay off in the form of improved market value data and therefore better assessments.

Statistical “Dummy” Variables for GMAs

Statisticians often employ “dummy” variables in multiple regression analysis when a variable they wish to use is more qualitative (e.g., categories such as type of construction) than quantitative (e.g., square feet) in nature. They can also be used when an area of interest does not have enough observations to permit proper operation of a procedure they want to use. In these cases, the observations from two or more areas are combined and dummy variables are

added to distinguish the areas from each other. This can sometimes produce useful results, but only if certain assumptions are met. Otherwise, dummies can lead to curious and undesirable effects.

For example, each of OPA's assessment zones is comprised of many, much smaller GMAs. It is our understanding from conversations with OPA staff that assessments are made by running a separate set of statistical procedures in each zone, using dummy variables to distinguish among GMAs within the zone.

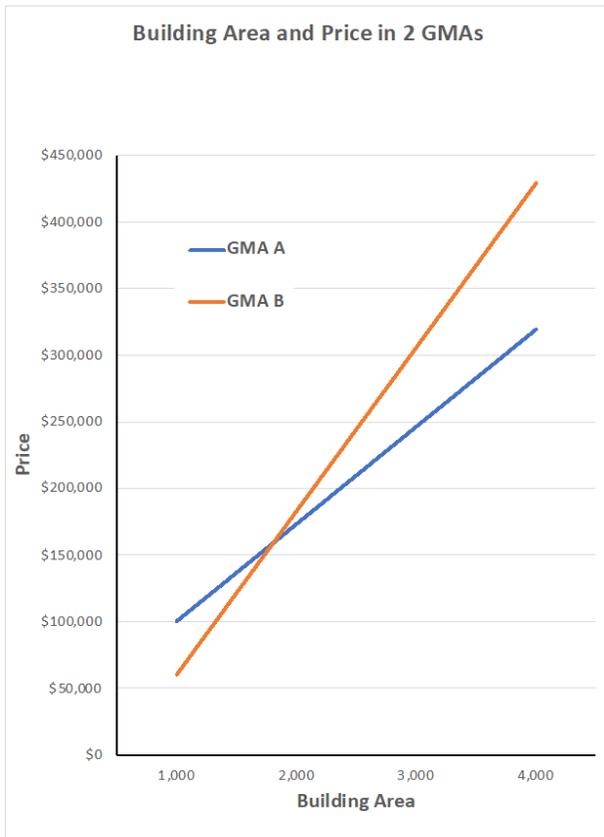
This practice produces accurate results only on the assumption that the relationship between price and property characteristics is identical for all GMAs within a zone, except that prices in each individual GMA may be higher or lower *by the same amount* compared to similar properties in all other GMAs. If this assumption does not hold, inaccurate results will be obtained.

Suppose, for simplicity, an assessment zone with only two GMAs, A and B, and a single property characteristic, number of building square feet, or area. Suppose the relationship between area and price is as shown in Appendix Figure 1.

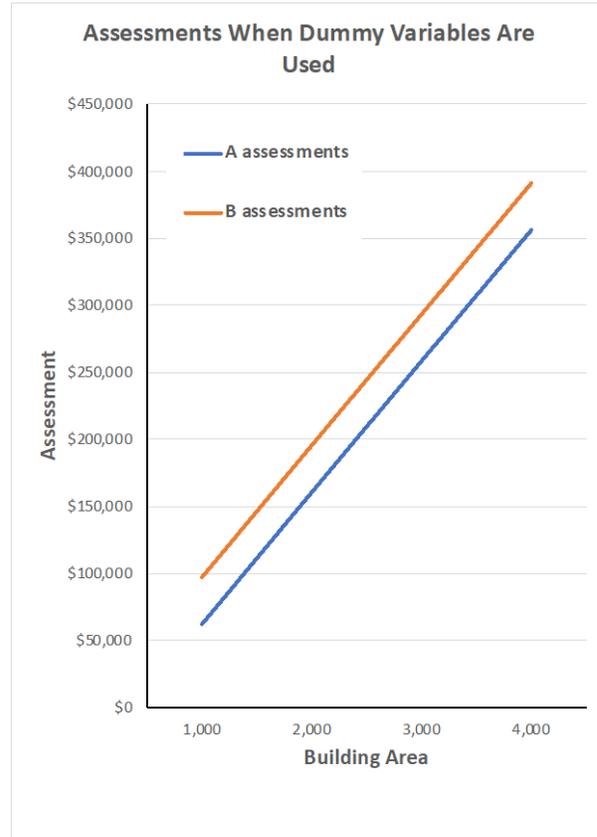
In each GMA, buyers place a premium on larger buildings, but the preference is more pronounced in GMA B. If each GMA is assessed independently, using only data from within its own borders, typical assessment procedures will produce assessments that closely match the market-value lines shown in Appendix Figure 1.

However, if data from the two GMAs are combined and a dummy variable is introduced as a way for the statistical procedures to separate properties in one GMA from those in the other, assessments will approximate the lines shown in Appendix Figure 2

The two lines no longer have different slopes representing different preferences for space in each GMA. Instead, the lines are parallel, suggesting a similar preference for space in each GMA, because the statistical procedures combine and average the two originally different preferences.



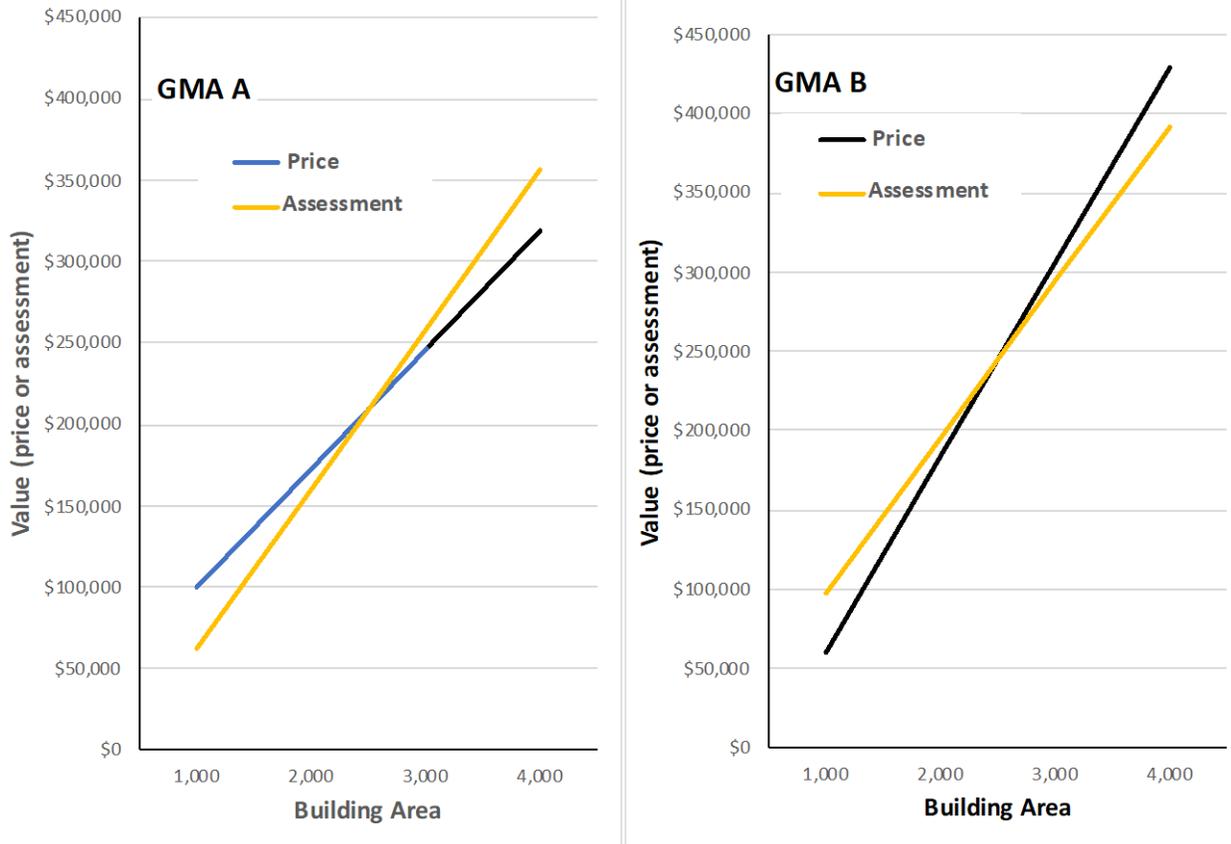
Appendix Figure 1: Relationship between building area in square feet and market price of the residence in two hypothetical GMAs.



Appendix Figure 2: Relationship between building area and assessments in two GMAs, when data from the GMAs are combined and a dummy identifies them.

Moreover, at any given point on the horizontal axis, the vertical difference between assessments in the two GMAs is the same in both amount and direction, despite this not being the case for actual market values in Appendix Figure 1.

Dummy variables, when used for GMAs, can distort and even reverse the relationship between actual market values and assessments.



Appendix Figure 3: Relationship between market price and assessments In two GMAs, when data from the GMAs are combined and a dummy identifies them. In GMA A, low value properties are under assessed; in B, they are over assessed.

Appendix Figure 3 compares the dummy-variable assessments in each GMA (from Appendix Figure 2) to the underlying market prices (Appendix Figure 1). In GMA A, lower value properties are under assessed and higher value properties over assessed, while in B it is reversed: Low value properties are over assessed and higher value are under assessed.

This reversal is only one of several anomalies that the use of dummy variables can introduce between and among GMAs. In this example, if the residents of GMAs A and B have different socioeconomic characteristics, they might interpret the different assessment inaccuracies as due to those characteristics when, in fact, the assessment differences may be disparate impacts caused by the use of insufficiently reviewed dummy variables.

We believe it very likely that some GMAs do not have enough sales to permit proper use of statistical assessment procedures within their individual borders. In such cases, using dummies

may be a reasonable second-best to assessing each GMA independently, but only if there is enough careful office review and possible adjustment of the assessments resulting from the equation.

Assigning Property Condition Codes

Properties in the same market area that are identical in all quantitatively measured respects – such as number of rooms, number of square feet, etc. – may nevertheless sell for different amounts of money because one is better maintained than the other. For this reason, assessments can be more accurate when a condition code is assigned to each property. “Condition,” of course, is at least partly in the eye of the beholder and so careful training of those assigning condition codes is important in order to make the codes as consistent as is humanly possible.

Based on our discussions with OPA staff, we understand that OPA has a standard set of condition codes and applies them on a citywide basis. That is, each property in Philadelphia receives a code ranking its condition, or quality, on a scale with all other properties throughout the city.

If this is what happens, we urge review of the practice because it seems to confuse two distinct market realities. (1) Not only do nearby properties that are quantitatively identical to each other sell for different prices based on their quality, but also (2) properties that are identical in all respects, quantitative and qualitative, sell for different prices based on their location in different parts of the city. Using citywide condition codes confuses these realities and can cause inaccurate assessments.

Generally speaking, the statistical methodologies of assessing work better when condition codes are assigned within each sub-city assessment zone or GMA, compared to when the codes are assigned citywide and then transferred into the smaller geographies.

Some Thoughts About Embracing the Goal of Fair and Uniform Assessments

Communitywide agreement on the goal of fair and uniform assessments may depend on consensus about the characteristics of a good tax system. There seem to be two broad approaches to this issue:

- (1) “Don’t tax you.
 Don’t tax me.
 Tax *that* fellow
 behind the tree.”⁶²

⁶²The late U.S. Senator Russell Long, describing the attitude of what he called “most people,” quoted by William B. Mead, “Congress Tackles the Income Tax,” *Money*, July 1973, p. 55. See <https://quoteinvestigator.com/2014/04/04/tax-tree>, viewed 3/16/22.

We call this the “They Pay” mentality.

- (2) “We are caught in an inescapable network of mutuality, tied in a single garment of destiny.”⁶³

We call this the “We All Pay” mentality.

The choice between these two tax policy goals is real. When people vote, post on social media, and engage in other political activities, they can think primarily about their own narrowly defined financial self-interest (the “They Pay” mindset). Or people can realize that their more complete self-interest is interwoven with the welfare of everyone else, including the fairness of spending and tax systems for everyone in the community (“We All Pay”).

In the abstract, City Council members and state legislators can encourage good assessing by setting a target range for the PRD of 0.98-1.03 and for the COD of five percent or less for residential assessments. The targets should be achieved for both the city as a whole and for reasonably defined subareas such as Census tracts, assessment zones, or city council districts.

In practice, however, no one can effectively mandate or enforce behavior consistent with the We All Pay approach to taxation. This is because *whenever accountability is sought through the imposition of performance targets, both individuals and institutions begin biasing data collection and behavior toward the targets*, often ignoring other important aspects of the overall task. *As soon as a performance measure becomes a goal, its effectiveness as a measure ceases*. This frequently observed tendency in human behavior is sometimes known as Campbell’s Law, Goodhart’s Law, or simply the law of unintended consequences.⁶⁴

The effects of Campbell's Law can be reduced, but not eliminated, through the combination of multiple performance measures, such as the median assessment ratio (already in state law) along with a low COD and within-range PRD. But such targets can consistently produce good assessments only when they are rooted in a strong commitment, throughout the city, to the goal of uniformly good assessments for everyone regardless of their economic status or interest-group affiliation, in other words, commitment to the We All Pay principle. Independent of any possible legislated goals, individuals (including executives and staff of OPA) must make their own choice to do the best job possible regardless of outside pressure one way or the other.

One way to foster widespread awareness and acceptance of We All Pay might be for community residents and government officials who seek a fairer system to host meetings and discussions where they explore the meaning of mutuality and promote concepts of a tax system

⁶³Martin Luther King, Jr., “Letter from a Birmingham Jail,” April 16, 1963.

⁶⁴Many people are familiar with the results of this behavioral law in education, where school reforms lead to “teaching for the test” and sometimes quite creative methods for excluding lower-performing students from the measurement base. For an introduction to the large body of writing on this subject, see “Campbell’s law,” https://en.wikipedia.org/wiki/Campbell%27s_law (viewed 10/8/22); “Goodhart’s law,” https://en.wikipedia.org/wiki/Goodhart%27s_law (viewed 10/1/22); and Frederick Hess, “Education Reforms Should Obey Campbell’s Law,” 6/12/18, <https://www.educationnext.org/education-reforms-obey-campbells-law> (viewed 10/8/22).

centered on a mutually understood sense of fairness. To prevent uninformed good intentions from leading to poor outcomes, people who genuinely understand and care about the property tax can be invited to the meetings. Again, to prevent good intentions from accidentally running amok, these people should remain close to any organizing and implementation campaigns that follow.

In addition, a well-designed social awareness campaign aimed at changing the narrative about property taxes can promote community buy-in to the We All Pay goal of uniformly fair assessments. We believe most people do not understand how the property tax system makes not only the community's revenue but also the fairness of each individual's tax dependent on everyone else's assessment. Education about this and other communitarian aspects of the property tax can arouse people's innate sense of fairness, encourage respectful conversations between the owners of high- and low-value property, and move the political environment closer to long-run support for an assessment system fair to everyone.

In short, the City relies on taxes to do everything that we collectively want and need (educating our children, policing our streets, picking up trash and plowing snow, etc.). One of the ways that the City pays for these services is through revenue received from property taxes. We All Pay is premised on the notion that if we as residents of the same city need and want these things, we should all contribute to paying their cost. As a society we've agreed that the amount that each one pays should be proportionate to the underlying value of their real estate asset. The Tax Them mentality, in addition to leading away from fair assessments, creates divisions and instability in the city. We All Pay overcomes divisions and, in addition to promoting fair assessments, lays the groundwork for reasoned dialogue about the kind of society and types of services we want.

Appendix II: A Note About Assessment Appeals

No discussion of assessments is complete without reference to the assessment appeal system. Successful homeowner appeals modify OPA's assessments and produce the final assessments on which tax bills are eventually based.

In Philadelphia, the appeal system includes a process of "First Level Reviews" (FLR) operated by OPA before they finalize their set of assessments, as well as subsequent appeals to the Board of Revision of Taxes (BRT), and for some property owners the courts. Our report examines final OPA assessments (after FLR) prior to any subsequent revisions by BRT or the courts.

On the one hand, an easily accessible appeal process is necessary because in any large system such as OPA's, there are bound to be mistakes. The appeal process is where assessment mistakes can be corrected and the final, taxable assessments potentially be made fairer. One step toward making the process more accessible would be to streamline the process – for example, creating a single form and clear instructions as to what facts (and where those facts might be found) the homeowner must submit for both an FLR and an appeal to the BRT.

Another significant step would be to commission a study of the appeals process at the BRT. Just as data plays a key role in our analysis of the assessment process, the City needs similar data and an analysis of the appeal process.

As necessary as an accessible appeal system is for correcting mistakes, the system results in inequities when people appeal for other reasons, for example, not because they are over assessed but simply because the system is there. The owners of high-value property typically have more resources to appeal than the owners of lower-value property. Even if only some of these appeals are granted without sufficient evidence of assessment inaccuracy, they increase regressivity – further increasing the degree to which there is systemic bias in the system which has a greater impact on homeowners who lack the time and resources to appeal.

It is perhaps less obvious but similar inequities occur even when the owners of low value property appeal correctly made assessments. Whenever anyone appeals not because they are over assessed but because they can, and some of these appeals are granted simply because they are made, taxes are shifted and the appeal system makes taxes not more fair but less so.

Fully understanding the impact of the appeal system on the fairness of Philadelphia property taxes requires a thorough evaluation of that system. Such an evaluation is beyond the scope of our current project.

Appendix III: Assessments, City and School Revenue, and Tax Bills

Property owners are rightly concerned about why and how their tax bills might change from one year to the next, especially when there is a reassessment. Often, owners' fears are greatly exaggerated. Assessments may increase by an apparently significant amount, while taxes in the following year don't increase nearly as much and, in some cases, may not increase at all. At other times, an owner's assessment may remain relatively unchanged while their tax changes by a larger percent.

This appendix explains in some detail why this happens, spelling out the relationships among an individual's property assessment, the total assessments of all property in the city, and the City's need for revenue. No one of these factors alone, but all of them together, must be taken into account in order to understand and estimate changes in any given tax bill.

READER ADVISORY! This section uses algebra to illustrate with precision what happens to individual tax bills when assessments, the total amount of property taxes desired by City agencies, and the tax rate can vary from one year to the next.

Readers who consider themselves math-phobic and others uninterested in math can safely skip this appendix and rely on the generalizations in the main body of our report.

Setting the Stage

In its simplest form, any property owner's tax bill is represented by Equation (1).

$$(1) \quad t_1 = r_1 a_1, \text{ where:}$$

t is the owner's tax bill.

r is the property tax rate.

a is the property's taxable assessment, after adjusting for all applicable exemptions.

The subscripts indicate years within the time period being analyzed, with 1 being the first, or base, year.

If there is a reassessment and the new assessment becomes a_2 but the tax rate remains unchanged, the second year's bill is

$$(2) \quad t_2 = r_1 a_2.$$

The change in tax bills from before the reassessment to after is

$$(3) \quad \frac{t_2}{t_1} = \frac{r_1 a_2}{r_1 a_1} = \frac{a_2}{a_1},$$

or simply the ratio of the second assessment to the first.

The result is similar if the assessment remains unchanged but the tax rate changes. Then the tax bill will vary by the same percentage as the tax rate.

When Rates and Assessments Both Change

What happens when there is a reassessment **and** the tax rate also changes? How do they offset or intensify each other?

To answer this, we express the tax rate in terms of the relationship between total taxable assessments and the total amount of revenue to be raised by the rate:

$$(4) \quad r_1 = \frac{L_1}{A_1}, \text{ where:}$$

L is the total amount of property taxes to be raised by the city and school board; this total is known in public finance jargon as the tax "levy."

A is the sum of all taxable assessments, that is, all assessments minus applicable exemptions.

For example, if a reassessment changes total taxable assessments to A_2 and local government officials decide to keep their levy the same, the new tax rate will be

$$(5) \quad r_2 = \frac{L_1}{A_2}.$$

This is a special case of the more general situation in which both levies and assessments can change from one year to the next. Eq. (6) spells out the relationship between post- and pre-reassessment tax bills in the more general situation.

$$(6) \quad \frac{t_2}{t_1} = \frac{r_2 a_2}{r_1 a_1} = \left(\frac{L_2}{A_2} \right) a_2 / \left(\frac{L_1}{A_1} \right) a_1$$

Performing the division and rearranging terms yields

$$(7) \quad \left(\frac{L_2 a_2}{A_2} \right) \left(\frac{A_1}{L_1 a_1} \right) = \left(\frac{L_2}{L_1} \right) \left(\frac{A_1}{A_2} \right) \left(\frac{a_2}{a_1} \right) = \frac{t_2}{t_1}.$$

Eq. (7) tells us that a reassessment can change tax bills even if the levy remains unchanged that is, if $\frac{L_2}{L_1} = 1$.

With an unchanged levy, if total assessments double ($\frac{A_1}{A_2} = \frac{1}{2}$), anyone whose individual assessment more than doubles will see a tax increase, anyone with less than a doubling will see a decrease, and those whose assessments roughly double will pay about the same as before.

For example, suppose someone's individual assessment triples ($\frac{a_2}{a_1} = 3$). Their post-reassessment tax will be $\frac{1}{2} \times 3 = 1.5$ times their pre-reassessment tax, or a 50 percent increase. This is higher

than before but nowhere near a tripling in tax because the reference point is the change in total assessments. Their tax increases by a factor of 1.5 because their assessment increased 1.5 times as much as the increase in total assessments.

Similarly, someone whose assessment increases but by only 50 percent ($\frac{a_2}{a_1} = 1.5$) will pay a post-reassessment tax of $\frac{1}{2} \times 1.5 = 0.75$ times as much as before. This is a 25 percent tax reduction in spite of the assessment increase. An owner whose assessment remains unchanged will have taxes cut in half. If the levy changes, it will have a proportionate impact on each of the calculations above. A 10 percent increase in the levy will multiply each of the results above by 1.1. The property owner whose assessment tripled will pay a new tax equal to $1.1 \times \frac{1}{2} \times 3 = 1.65$ times their pre-reassessment tax. The owner whose assessment increased by 50 percent will pay $1.1 \times \frac{1}{2} \times 1.5 = 0.825$ times as much as before. And any owner whose assessment exactly doubled will pay 10 percent more.



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